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HANDBOOK

FOR THE

PUBLIC LIBRARY 15. MAY. 1912 OF VICTORIA

6-INCH B.L. HOWITZER, 30 CWT.

1909.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
BY HARRISON AND SONS, ST. MARTIN'S LANE,
PRINTERS IN ORDINARY TO HIS MAJESTY.

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E. PONSONBY, 116, GRAFTON STREET, DUBLIN.

Price One Shilling.

47
364

Amendment to the Handbook for the 6 inch B.L. howitzer, 30 cwt., 1909.

Page 11. Insert after the end of the 8th paragraph :—

When the howitzer is being fired *not* from a platform, the travelling brakes may, if considered desirable, be applied for the purpose of checking excessive recoil.

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W.O.
1896

HANDBOOK 6-INCH B.L. 30-CWT. HOWITZER. 1909.

AMENDMENTS.

PAGE

16 *Delete* "Brush, breech screw" (inserted vide Amendments published May, 1910) and *Re-insert* "Brush, water, carriage."

Re-insert "Lamp, siege (or lantern bulls-eye) in box . . 1."

18 *Against* "Discs, pad, obturating, adjusting ... ... 4"

Insert "(Spare and components)."

18 *Delete* "Reel, carpenter's ... ... 1"

19 Ties, linch pin *For* "10" *Read* "4"

54 (DIAGRAM A)—

Insert "Tarpaulin" (on footboard).

Delete "1 Reel, carpenter's—"<br>"1 line, carpenter's"
"1 Plummet laying—" } from lower tray.

"Socket extending worm spindle" from bottom of limber box.

Amend Ties, linch pin—'10' *to read* '4'

Delete "1 Lever jamming, handwheel, elevating" from inside of trail and after
"1 Spanner, No. 182, elevating gear"
insert
"or 1 lever jamming, handwheel."

September, 1910.

(2203) Wt 20637—814 1,500 10/10 M & Co $\frac{P. 10}{285}$

Handbook for the 6-inch B. L. Howitzer,

30 cwt.

1909.

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AMENDMENT.

Page 46.—*Insert* "‡" after "round;" in line 2 of instructions "To Close the Breech," and *add* footnote :—

"‡ The breech is not to be slammed, on account "of the liability to fracture the carrier ring if this "is done."

26146 2400 11—10 H W V P. 10/363

HANDBOOK FOR THE 6-INCH B.L. HOWITZER, 30 CWT., 1909.

AMENDMENTS.

Page 46, line 43, *after* "direction," *add*

"," clamping time fuzes as tight as possible.†"

Add footnote

"† Time fuzes should be securely clamped to reduce the chances of prematures, caused by the slipping of the time ring."

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AMENDMENTS

TO

HANDBOOK OF 6″ B.L. HOWITZER, 30 CWT.

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1909.

"EQUIPMENT."

Page 7, line 24. *Delete* "and washer."

Page 9, line 37. *After* "on" *insert* "off platforms"

Page 12. "List of Stores carried on the carriage." *After* "Pincers," etc., *add* "post, picket 5′ or 6′ ... 1."

Page 13. *After* line 5 *add* "staves end ... 1"

Page 16, line 18. *For* "Brush, water carriage" *read* "Brush, breech screw."

Page 16, line 28. *Delete* "Lamp, siege (or lantern, bull's-eye) in box ... 1"

Page 16, line 32. *After* "Shovels, G.S." *insert* "and spades." *Delete* "2" and *insert* "4."

After line 35 *insert* new line "Tarpaulin (on footboard) ... 1."

Page 18, line 10. *For* "Chalk, white, etc." *substitute* "Chalk prepared, boxes ... 1."

Page 18, line 15. "Discs, pad, obturating, adjusting," *for* "2" *read* "4."
"Discs, pad, obturating, protecting," *before* "3" *insert* "sets."

Page 18, line 26. "Lanyards, etc." *delete* "lower tray" and *insert* "with tube pocket."

Page 18, line 28. *Delete* "Lines, carpenter's ... 1."

Page 18, line 39. *Delete* "Plummet laying ... 1."

Page 18, line 41. "Pliers, side cutting, etc." *delete* "bottom of box" and *substitute* "lower tray."

Page 18, line 44. "Plugs, tube, protecting piston tail rod ... 1," *for* "lower tray" *substitute* "wrapped in sponge cloths at bottom of box."

Page 19, line 3. *Delete* "socket extending, worm spindle ... 1*" and footnote.

Page 19, line 6. "No. 180 ... 1" *delete* "lower tray" and *substitute* "bottom of box."

Page 19, line 24. "Ties, linch pin," *delete* "bottom of box" and *substitute* "with linch pins."

Page 44, line 13 from bottom of page. *After* "take post" *add* "The limbers should be placed on the flanks of the battery in action as much under cover as possible, but should there be no cover at a convenient distance from the battery, the limbers of the right section of four guns (right hand gun of two guns) should be placed about 20 yards to the right rear of the battery; those of the left section of four guns (left gun of two guns) should be placed about 20 yards to the left rear of the battery, shafts to the front."

Page 44, last line. *For* "shell magazines" *substitute* "expense shell store or ammunition wagon."

Page 45, line 7. *Delete* "50 foot tape,"

Page 45, line 7 from bottom of page. *Delete* from "reversing" to end of sentence and *substitute* "seeing that it is mounted so that the object glass is pointing to the rear."

Page 46, line 2. *Delete* from "loosens" to "issued" and *insert* "fuzes, shells, as ordered."

Page 46, line 29. *After* "right hand" *insert* "; releases latch retaining carrier ring, open with his left hand."

Page 46, line 8 from bottom of page. *Delete* from "1" to "required" and *substitute* "1 gives out the nature of shell, fuze and charge required"

Page 46, line 3 from bottom of page. *Delete* from "If time" to "set" in next line.

Page 48. *Delete* first para.

Page 48, line 24. *Delete* "Deflection."

Page 48, line 25. *Delete* "Elevation" and *substitute* "(elevation)"

Page 48, line 33. *After* "clinometer" *insert* "chalks the amount either wheel is high on the felloe of the right wheel, *e.g.*—R.W. 1° 30′,"

Page 49, line 11. *After* "elevation." *insert* "Section commanders should only repeat the deflection and elevation when an alteration is ordered by the battery commander, or when a casualty occurs."

Page 49, line 16. *For* "1," *substitute* "4."

Page 51, line 8. *After* "carried out" *insert* "The following points particularly require his attention in preparing for action :—

(*a*) The filling and securing of the anchoring buffer.

(*b*) The steadiness of the trail plank when used.

(*c*) The clearance of $\frac{1}{10}$th inch of plugs, tube protecting, tail rod.

(*d*) The security of the wheels.

(*e*) The state of the dial sight, elevating gear, and, when firing from the ground, the brake.

(*f*) That the housing bracket is folded back."

Page 54. "Diagram of packing A," *amend* as follows :—

Add "1 post picket, 5′ or 6′ under trail."

Add "1 stave end under trail."

Delete "shovel" from on either side of limber box and *substitute* "Shovels or spades," 2 on each side.

Delete "handsaw in case" from rear of limber box and put in front of limber box instead.

Limber box.

Delete "Ties, linch pin 10," and show them in the compartment with the linch pins.

Delete "1 pair pliers, side cutting," and show them in lower tray.

With "sponge cloths, etc." *add* "Plugs, tube protecting, piston tail rod," and *delete* from lower tray.

Limber box, lower tray.

Delete "§ 1 spanner, tension bolt and pivot plug No. 180," and show it in the bottom of box.

Delete "2 lanyards, firing, field, T Mark II or III," and show them in limber box with the tube pocket.

Delete "§ 1 plug, tube protecting, piston tail rod."

Delete "4 ozs. chalk, white," and *substitute* "1 box prepared chalk."

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HANDBOOK

FOR THE

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CONTENTS.

DIAGRAM OF PACKING.

PLATES.

N.B.—*This Book is corrected up to March, 1909. Any alterations which may be suggested should be forwarded direct to Chief Inspector, Royal Arsenal, Woolwich.*

ORDNANCE, B.L. 6-INCH 30 CWT. HOWITZER, MARKS I AND I*.

DESCRIPTION.

(*Plate I.*)

Material			Steel
Length, total			94 inches
Weight of	howitzer with fittings		28 cwt. 3 qrs. 5 lbs.
	breech fittings		1 cwt. 2 qrs.
Bore	length		84 inches, or 14 calibres
	calibre		6 inches
Chamber	diameter		6·4 inches
	length	Mark I howitzer	6·7 ,,
		,, I* ,,	8·75 ,,
	capacity	Mark I howitzer	229 cubic inches
		,, I* ,,	295 ,, ,,
Rifling	system		Polygroove, hook section
	length	Mark I howitzer	74·9 inches
		,, I* ,,	72·85 ,,
	twist		Uniform, 1 turn in 15 calibres
	grooves	number	24
		width	0·6 of an inch
		depth	0·05 ,,
Obturation			Pad
Firing mechanism			Friction T tube
Venting			Axial

The howitzer is made of steel (without trunnions), and consists of A and B tubes, breech bush, jacket, breech ring and sight ring.

The B tube is shrunk over the A tube and secured longitudinally by means of corresponding shoulders and the breech bush, which is screwed into the B tube at the rear. The breech bush is prepared for the reception of the breech screw, and is prevented from turning when in position by means of a steel stud which is screwed partly into the bush and B tube. Over the B tube is shrunk the jacket, secured longitudinally by corresponding shoulders, and a screwed steel ring at the rear. The breech ring (which is furnished with lugs for the attachment of the howitzer to the hydraulic buffers of the carriage, and for the attachment of the breech fittings) is screwed over the jacket at the rear. A sight ring, prepared for the reception of the fore sight brackets, is shrunk round the B tube in front of the jacket, and secured by means of a set screw.

Longitudinal projections on the side of the jacket act as guides for the howitzer when in the cradle.

A plane for clinometer is prepared on the rear portion of the jacket immediately in front of the breech ring.

The chamber is cylindrical, slightly coned at the entrance, and terminating in front with a curved slope.

Mark I* howitzer differs from Mark I in having the chamber enlarged and the length of rifling consequently reduced.

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BREECH MECHANISM.

(*Plate II.*)

The gun is fitted with "Three-Motion Breech Mechanism." The mechanism is actuated by three distinct motions in opening or closing the breech, as follows :—First, raise the cam lever. Second, turn the breech screw to the left as far as it will go. Third, withdraw the breech screw to the rear and swing the screw and carrier ring into loading position. Reverse the above action in closing the breech.

Description of Breech Mechanism.

The breech is closed by a screw having three portions of the screw thread removed longitudinally, each one-sixth of the circumference. The interior of the howitzer, at the breech, being prepared in a similar manner, admits of the screw, when the raised portions are placed opposite the smooth surfaces in the howitzer, being pushed home, and locked by the sixth of a turn.

The breech screw has hinged to it a cam lever, by means of which it is locked and unlocked ; the cam portion of the lever (when the breech screw is locked) engages in a recess in the carrier ring, and so prevents any movement of the breech screw during firing. In lowering the cam lever after the breech screw is unlocked, the cam, acting upon the surface of the carrier ring, starts the first movement to the rear of the breech screw and obturator.

A "catch" is provided on the handle of the breech screw for retaining the cam lever in the down position.

Encircling the rear end of the breech screw, and hinged to the breech ring, is a carrier ring which supports the screw when withdrawn.

The carrier ring is held to the howitzer, during the withdrawal of the breech screw, by means of a clip fitted to the left side of the ring, engaging with a recess in a projection on the rear face of the breech ring.

A stop bolt, in the right side of the carrier ring, serves to prevent the breech screw being disengaged from the carrier ring when withdrawn ; at the same time, the clip in the left side of the carrier ring is disengaged from the recess in the projection on the breech ring by means of a spiral spring, which forces the opposite end of the clip into a recess in the breech screw, thus securing the latter in the carrier ring. When in this position, the whole can be swung clear of the breech opening to admit of loading.

The carrier ring is retained in the loading position by a "latch."

If, when opening the breech, the carrier ring remains fast owing to the "clip retaining" not working properly, the latter can be pushed back by inserting one of the screw driver ends of the breech mechanism wrench in the hole provided for the purpose on the left side of the breech.

OBTURATOR.

Obturation is obtained by means of a mushroom-headed axial T vent of steel, passing through the centre of the breech screw, with a pad

and a pair of metal discs. The inner face of the breech screw is flat, and, between it and the head of the axial ⊤ vent, the pad and discs are arranged. The pad is made of asbestos, worked up with mutton suet to a proper consistency, and enclosed in a strong canvas cover; it is reduced to shape, and pressed in a hydraulic machine.

The pad is enclosed between two protecting discs of tin, the outer angles of which are protected by steel rings. The howitzer is slightly coned at the seat of the obturator, and the pad is provided with a corresponding taper to insure a good fit.

The disc are stamped with the words "Front" and "Rear" respectively, and the pads have the words "Front" stencilled on the side which corresponds with the front disc, and "Rear" on that which corresponds with the rear disc, in order that they may be correctly assembled on the axial ⊤ vent.

In putting the obturating pad and discs on the axial ⊤ vent, first place the front protecting disc with its rounded side fitting the back of the mushroom head, then the pad with that side to the front which is curved to fit the front disc, the stitched side being to the rear, then the rear protecting disc, and in placing this, its flat side and the bronze ring with which it is bushed, should be on the opposite side to the pad.

If correctly assembled the whole should fit together compactly.

Should there be any play between the obturator and the face of the breech screw, one or more adjusting discs are placed behind the protecting disc.

When the breech screw is pushed into the howitzer, the obturator enters the chamber with perfect ease; on turning the breech screw, the obturating pad is pressed home into the coned seat in the howitzer by the travel of the screw. The bore is thus perfectly closed by a species of buffer in contact all round the circumference, while the mushroom head of the axial ⊤ vent receives the force of the gas on discharge. On firing the howitzer, the pressure acts on the mushroom head of the vent and compresses the pad against the breech screw, causing it to expand laterally; from symmetry of form and position, this expansion must be radial to the axis and equal in every direction, and is sufficient to prevent the escape of gas. On the pressure beng removed, elasticity comes into play, and the obturator can be withdrawn from the cone by a straight pull, which can be given so soon as the screw is unlocked.

Full instructions regarding the fitting, testing, adjusting and treatment of obturating pads are contained in "Regulations for Magazines and Care of War Matériel."

FIRING MECHANISM.

The firing mechanism is designed for friction firing, with ⊤ tubes.

It consists of a steel axial vent, passing through the centre of the breech screw, having secured to its outer end a head for the reception of the ⊤ tube. The vent is retained in the breech screw by means of a spring and nut. Fitted to the outer face of the breech screw, and encircling the vent head, is an actuating collar, worked by the cam lever and link, by means of which the ⊤ tube is automatically turned into the firing position, when the cam lever is lowered.

The ┬ tube is automatically released from the vent and turned into the position for withdrawing, when the cam lever is raised, the tube being withdrawn by hand.

SIGHTING.

(*Plate III.*)

The howitzer is sighted on both sides with crossbar sights, and for Siege Artillery is also provided with a dial sight with telescope on the cradle of the carriage.

CROSSBAR SIGHTS.

The tangent sights drop into sockets, and are set vertically. The vertical bars, which are of steel, are graduated to 10°, adjustment being effected by removable clamps. The sights have bronze heads with clamping screws, and a steel horizontal crossbar, which slides. within the head to the extent of 1° to the right, and 3° to the left, for deflection. The bar is provided with a sliding reversible leaf, having a notch for forward laying; this leaf is provided with a point, and cross wires for reverse laying. The bar is graduated from 0 to 6 right, for the right side, and 6 to 0 left, for the left side. The bars are reversible, being graduated upon one edge for the right side, and on the opposite edge for the left side of the piece, and are stamped accordingly.

The sights are adjusted by means of the removable clamp.

The fore sights fit into brackets which are attached to the sight ring on the chase of the howitzer by means of a dovetail, and fixing screw. The sights are of the drop pattern, and consist of a steel stem with horizontal half-crossbar (forged solid), a jacket and socket. The bar is fitted with a sliding reversible leaf, having a point, for use with the notch of the tangent sight, for forward laying, and a notch and eyehole, for reverse laying. The socket is permanently fixed in the fore sight bracket, by means of a fixing screw passing through the bracket and projecting into the socket. The stem locks into the socket with a bayonet joint, and is prevented from turning by a projection on the jacket, which drops into a recess in the sight bracket when the sight is in its true position. The sight cannot be removed without first raising the jacket and turning the stem round a quarter of a circle. The sight is hardened so as to prevent bending, when left in position in the howitzer, during firing.

The sights are left and right, the horizontal half crossbars being graduated from 0 to 6 right, for the right side, and 6 to 0 left, for the left side respectively, to correspond with the graduations on the crossbars of the tangent sights.

DIAL SIGHTS.

For description see page 13.

Stencilling on Howitzer.

Abbreviated headings, of the necessary information required for laying the piece, are stencilled on the cradle and chase of the howitzer. as shown on Plate IV, which should be strictly adhered to in renewing the lettering.

TO REMOVE THE BREECH FITTINGS.

Before removing the fittings, the breech should be opened, the breech screw being swung into the loading position.

Cam Lever.

Take out the keep pin of the hinge bolt, when the latter can be removed and the cam lever withdrawn.

Link, Actuating, Collar.

Unscrew the axis pin of the link and withdraw the link.

Collar, Actuating.

Unscrew the check screw half a turn, then turn the collar until the indicating arrow on it corresponds with the arrow and the word " enter " engraved on the outer face of the breech screw, when the collar can be withdrawn.

Axial T Vent, and Obturator.

Unscrew the nut of the axial T vent, and withdraw the latter with the obturating pad and discs from the front of the breech screw, the spring and washer can then be withdrawn from the rear. To remove the obturator from the axial T vent, the latter should be held by the head, and the small end knocked gently on a block of wood when the pad and discs will drop off the stem.

When the obturator is attached to the breech screw, the removal of the latter from the carrier ring should be done by two persons, as care is necessary to keep the " clip, retaining carrier ring " withdrawn clear of the breech screw, before drawing the latter back, to avoid damaging the obturating pad and discs. The obturator should, however, always be detached, when possible from the breech screw before removing the latter from the carrier ring.

Breech Screw.

Withdraw the retaining clip from the breech screw and hold it back, move the breech screw forward in the carrier ring and push the stop

bolt out from behind; the breech screw can then be withdrawn from the carrier ring, the retaining clip being held back until the former is clear of the ring.

Carrier Ring.

Press down the retaining latch of the carrier ring, and place the latter in such a position as to admit of the set screw of the hinge bolt being unscrewed; the hinge bolt can then be removed and the carrier ring withdrawn from the breech. Care must be taken to replace the set screw in the howitzer when the carrier ring has been withdrawn.

Clip, Carrier Ring.

Remove the set screw, when the clip and spring can be withdrawn from the carrier ring.

Catch, Cam Lever.

Unscrew the axis pin of the lever of the catch; the lever, and catch with spring can then be removed.

Latch, Carrier Ring.

Press down the latch until the stop screw is at the bottom of the slot, then unscrew the stop screw, and remove it, when the latch and spiral spring can be withdrawn.

To Reassemble the Breech Fittings.

The converse of the above takes place in reassembling the fittings on the howitzer.

Care must be taken when placing the axial T vent and obturating pad and discs in the breech screw, to see that the indicating arrows engraved on the head of the axial T vent and the front end of the breech screw correspond, as it is in that position only that the feather in the breech screw will engage with the featherway for its reception in the axial T vent.

In placing the actuating collar in position in the breech screw, the indicating arrow on the collar must correspond with the arrow and the word "enter" engraved on the outer face of the breech screw. When the collar is placed in the breech screw, it must then be turned until the indicating arrow corresponds with another arrow with the words "engage link" on the breech screw, before the link of the actuating collar is placed in position.

CARE AND PRESERVATION OF HOWITZER AND FITTINGS.

See "Regulations for Magazines and Care of War Matériel."

Special Instructions not in the above mentioned Regulations.

The breech fittings should be kept clean, oiled or greased, and in good working order; all working surfaces must be well lubricated, the fittings being taken off sometimes for this purpose, especially after firing.

To lubricate the hinge bolt of the carrier ring without removing the fittings, the small screw on the top of the hinge bolt should be removed and oil poured into the channel, taking care to replace the screw after oiling.

All fittings of the howitzer should be treated with care; violence and jerks should be avoided, and no unnecessary force should be employed.

The breech fittings should work easily, and be free from cracks and burrs; the latter can be removed by filing, but this must be done carefully so as not to permanently damage the fittings. Should a crack be observed in a breech fitting, such fitting should be exchanged.

The threads of the breech screw should be free from burrs; should the screw not work easily, when the obturator has been detached, the defect may often be remedied by careful filing, but no portion of the thread should be cut away to remove a crack.

DESCRIPTION OF

Carriage, siege, B.L., 6-inch 30 cwt. howitzer (Marks I and I*).
Carriage, siege, top, B.L., 6-inch 30 cwt. howitzer (Mark I).
Limber, siege, B.L., 6-inch 30 cwt. howitzer (Mark I).
Box, limber, B.L., 6-inch 30 cwt. howitzer (Mark I).
Box, store, B.L., 6-inch 30 cwt. howitzer (Mark I).
Platform, siege, double-decked (Mark II).
Holdfast, platforms, siege, double-decked (Mark II).
Plate, pivot, double-decked platform (Mark II).
Arm, radial, pivot, double-decked platform (Mark II).
Buffer, anchoring, B.L. 6-inch 30 cwt. howitzer carriage.
Plates, wheel, platform, siege (Mark I).
Planks, traversing, B.L., 6-inch howitzer (Mark I).
Plug, pivot, No. 18, Mark II.

CARRIAGE, SIEGE.

(*Plates V, VI, and VII.*)

The carriage is constructed to allow of the howitzer being fired at angles varying from point blank to 35° elevation or 10° depression. The howitzer recoils axially in a cradle, which is fitted with hydraulic buffers to limit the recoil to about 18 inches, and with powerful springs to return it to the firing position. An anchoring buffer for checking the recoil of the carriage when firing with the wheels on is held in a stay, which is attached to the axletree; when in use it is connected to the radial arm of the pivot plate, and brings the carriage to rest in a recoil of about 5 inches. The carriage can, with the addition of the top carriage and the removal of the wheels, be used as a howitzer bed; when so used it is secured by a pivot plug to the pivot plate of the double-decked platform. A 4½-inch roller scotch is provided for travelling purposes.

The carriage consists chiefly of the following parts:—

1. Side brackets, forming the trail.
2. Cradle, with hydraulic buffers and springs.
3. Anchoring buffer.

4. Elevating gear.
5. Brake gear.
6. Traversing gear.
7. Axletree and wheels.

Side brackets.—The side brackets, which are of double plate construction, are connected by top and bottom plates, transoms, and a trail eye bracket. Brackets of cast steel are riveted to the front, the upper part of which is formed to hold the trunnions of the cradle, and the lower part of the axletree. The front transom is a hollow casting of steel, with a projection formed on the rear part by which the carriage (when used as a howitzer bed, *i.e.*, without wheels and with the top carriage) is secured to the pivot plate, and a projection on the front part to which a brake bar is pivoted. A trail eye of cast steel is hinged to the trail eye bracket. A socket for a sighting step is fixed to the front end of each side bracket of carriages in the siege train.

Cradle.—The cradle is in one casting of steel, with trunnions. It has an opening in the upper part, in which the howitzer slides on recoil, and two cylindrical openings in the lower part, each formed to take a hydraulic buffer. Each buffer (Plate VII) consists of a steel tube, A, piston rod gland, B, floating piston gland, C, tail rod gland, E, piston, F, with rod, G, and tail rod, H, floating piston, J, springs, K, tube protecting tail rod, L, with plug, N, and bush, N′. The tube, A, which is closed at the rear by the gland, B, and at the front by the gland, C, is recessed at the front end to receive the floating piston, J, which is closed to the cylinder by the tail rod gland, E. A block, M, at the front end of the tail rod, forms a bearing for the front end of the springs, K, which are held in initial compression (and thus retain the howitzer in the firing position) on the tube, L, by means of the plug, N. The interior of the tube, A, is slightly tapered so that the space around the periphery of the piston may form a varying orifice for the flow of the liquid; by this means an approximately constant pressure is maintained in the buffers throughout their stroke. A connecting pipe is fitted between the buffers to equalise the pressure. Filling holes are provided at the rear of the cradle for filling the buffers.

On firing, the piston rods, which are connected to the breech ring of the howitzer, are drawn out of the tubes at one end, and at the same time the tail rods, H, are drawn in at the other; as the sectional area of the latter is greater than that of the former, the liquid which passes the pistons during recoil forces the floating pistons, and the glands, E, attached to them, outwards, thus further compressing the springs, K; the energy thus stored up in the springs causes the howitzer to return to the firing position. The strain, due to the compression of the springs when the howitzer is fired, is taken by the block, M, bar, O, and tension bolts, P. The travel of the piston averages about 17½ inches, and the floating piston about 3 inches.

Small flats are cut on the piston rod for use when bringing the howitzer from the travelling to the firing position.

A hand pump is fixed to the top of the left side of the cradle, for running up when the howitzer fails to return to the firing position. It is connected to the buffers by a steel pipe and elbow connection, and is fitted with a cut-off valve for closing the connection between the pump and the buffer. The valve must always be screwed home before firing by means of the spanner No. 265.

The cradle is marked on the left side with a line of white paint, in such a position that when the line is opposite the bracket of the carriage the howitzer will be in the loading position.

The cradles of howitzers in the siege artillery are fitted on each side with a bracket for supporting the No. 4 dial sight. The bracket is provided with adjusting screws, adjusting bush and clamping handle. The adjusting screws are secured by locking pins* and act on opposite sides of a lug on the bush; this arrangement permits of an adjustment for alignment. The bush is suitably formed for the reception of the stem of the sight which is readily secured or released by the eccentric motion of the clamping handle.

Elevating gear.—The elevating gear is actuated by a handwheel, which transmits motion through worm wheel gearing, to an elevating arc attached to the left side of the cradle. A frictional arrangement is fitted in the hollow boss of the worm wheel, consisting of alternate plates of metal and steel respectively, arranged to revolve with the spindle and worm wheel. The plates are pressed together by a nut, which is adjusted so as to produce sufficient friction to prevent the howitzer running down when at extreme recoil. Stops are fitted to the side brackets to limit the depression of the howitzer to 10°.

The elevating gear of carriages in the siege artillery differs from that described above in having a jamming handwheel instead of a nut on the end of the pinion spindle. A lever is provided for use in conjunction with the jamming handwheel; and a projection on its face engaging with one of the spokes or arms enables the friction plates to be compressed sufficiently to prevent undue slip on firing.

The original intention of the handwheel was to enable the friction plates to be readily loosened to permit of a quick motion elevating arrangement which is not now considered necessary. Carriages fitted with this pattern of elevating gear are known as Mark I*.

A clamping arrangement is fitted to the left side of the carriage, and consists of a clamp, nut, friction plate, and lever. The clamp passes through the side bracket, and is actuated by the lever which moves the nut, clamps the elevating arc of the carriage against the inner face of the bracket, and secures the cradle in any required position.

Brake gear.—The brake gear consists of two brake arms (each fitted to hold a wooden brake block), two tensile rods, a brake bar, and a handwheel. The brake blocks are applied by means of the handwheel, on the right tensile rod, which is cut with a square thread on its front end to engage with a nut formed in the boss of the handwheel.

A bracket for carrying the equalising brake bar is formed on the front transom, so placed that it will clear the lower tension bolt of the running out springs when the gun is at 10° depression, as well as the buffer springs when the anchoring buffer is housed for tavelling, or when the carriage is fixed to the wheel plate and used as a bed. The brake bar is bent in the centre to suit the bracket.

The axletree is of tubular steel with 1st class arms; it is secured in position by nuts and screws.

The wheels are 1st class "B" No. 8†, 5 feet in diameter, metal flanged, with 12-inch pipe box, and 4-inch tire.

An arrangement for compressing the running out springs is fitted to the lower part of the trail.

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* In future the locking pins will be replaced by locking nuts.

† These wheels will eventually be superseded by No. 10 wheels.

For travelling, the howitzer is housed by disconnecting the piston rods from the breech ring of the howitzer, and allowing it to slide back so that the projections on the breech ring may rest in a hinged bracket* fitted to the bottom plate of the carriage; the elevating gear is then clamped to prevent any movement of the cradle. The anchoring buffer is removed from the carriage, and the stay, R, is hooked up to the suspending chain. The anchoring buffer for travelling is carried with the platform, and is never to be in its stay, except when the howitzer is mounted on its firing platform. The method of removing the buffer is explained on page 23.

ROPES, CHECK, B.L. 6-INCH HOWITZER, NOS. 1 AND 2.

The above-mentioned check ropes are for use with the carriages when without holdfasts or platforms.

The ropes are made of 2-inch galvanised steel wire rope, the ends being fitted with eyes and thimbles.

The No. 1 check rope is for use with carriages which are provided with elongated holes at the rear end of the trail, *i.e.*, carriages from which the traversing gear has been removed.

It consists of two wheel ropes each 2 feet 8½ inches long overall for passing round the felloes of the wheels and one coupling rope 7 feet 8·15 inches long with a hook at one end and a que at the other, for passing through the elongated holes at the rear end of the trail and connecting the wheel ropes.

No. 2 check rope is for carriages of recent manufacture which have *not* been fitted with traversing gear. It consists of two wheel ropes, each 2 feet 8½ inches long overall, for passing round the felloes of the wheels; one coupling rope, 7 feet 8·15 inches long overall, with a hook at one end and a que at the other for passing through the trail eye and hooking into one of the wheel ropes, and one lengthening rope, 3 feet 7·875 inches long overall, with a hook at one end for connecting a wheel rope with a coupling rope.

Drag shoes with wire rope connections are used in place of check ropes on carriages in Malta.

List of Stores carried on the Carriage.

(*See* Packing diagram A.)

Item		Number
Brushes	piasaba	1
	breech screw	1
Bit, vent, 14-inch		1†
Cover	breech	1‡
	muzzle	1§
Can, oil, lubricating, No. 9		1
Hammer, claw, 28-oz.		1
Handspikes, common, 6 feet		5
Lever jamming handwheel elevating		1
Lever, pointed, No. 2		1
Pincers, carpenter's, pairs		1

* This bracket should always be turned back during firing, as at large angles of elevation it is liable to damage on recoil.

† In action only.

‡ As convenient when not on howitzer.

§ When not with howitzer.

Rammer	1
Rimer, vent, T	1*
Ropes, check Nos. 1 or 2	1
Spanner, McMahon, 15-inch†	1
Spanner, No. 182 (elevating gear)	1

CARRIAGE, SIEGE, TOP.

(*Plate VI.*)

The carriage consists of two double plate side brackets, each formed with a trunnion bearing in the upper part (for the trunnion arms of the cradle), and a front transom of cast steel; the brackets are connected to the siege carriage by pins and the front transom. The elevating gear is the same as that used with the siege carriage, but with the addition of an extending spindle, which is keyed between the worm spindle and the handwheel.

Elevation, varying from 35° to 70°, can be obtained when the top carriage is connected to the siege carriage and used as a howitzer bed, but on an emergency the top carriage can be safely fired from at any elevation.

In travelling, the top carriage is carried separately.

SIGHT, DIAL, No. 4, MARK I.

(*Plates IX and X.*)

The sight is specially designed for use, together with the No. 2 sighting telescope (page 14), for indicating (1) the quadrant angle of elevation of the howitzer; (2) the angle of direction; (3) the angle of deflection, and is provided with an arrangement to compensate for any error due to a difference in the level of the carriage wheels.

The stem (A) is formed to carry the crosshead, and to fit into the bush of the sight bracket on the cradle (page 10).

The crosshead (B) is pivoted longitudinally to the stem, to enable the degree scale plate to be levelled, and carries the elevating arrangement (C).

The degree scale plate (D) is pivoted transversely to the crosshead, so that the required angle of elevation may be given to the scale plate. Its upper portion is circular in form, and has a degree scale ring fixed to its periphery for indicating angles of direction. The ring is marked in degrees from 0 to 179 in red on the right side and from 1 to 180 in black on the left side.

A reader plate (E) and a trunnion bearing (F) for the telescope carrier are pivoted to the centre of the degree scale plate, and are connected to each other by a screw with a nut (H, J) at each end. Each nut is provided with a scale ring graduated in divisions of one minute, which are read in conjunction with an index bar (G) fixed to the screw. The reader plate may be clamped at any angle of direction on the scale plate; it is provided with a reader on its outer end by which the whole degrees are indicated on the scale ring, while the minutes are indicated on the direction nut (J). Deflection is obtained

* In action only.

† Will be replaced by "spanner adjustable 15 inch" when stock is used up.

by means of the deflection nut (H), the degrees, 5 right and 5 left, being indicated by markings on the index bar, and the minutes on the deflection nut (H). The figures for right deflection are in red, and those for left in black.

The telescope carrier (K) is pivoted horizontally to the trunnion bearing, and is provided with caps and screws for securing the telescope. The front cap is formed with an acorn foresight (L) and the rear cap with a notched leaf hindsight (M). These sights are used for rough laying. The carrier may be moved through, or clamped within small angles of elevation and depression independently of the motion of the elevating arrangement, and is provided with a pointer, which, together with an arrow on the trunnion bearing, indicates when the carrier is parallel to the scale plate.

The elevating arrangement consists of an elevation indicator drum (C) and a screw (N) the drum is mounted on a trunnion bearing pivoted to the crosshead, and the screw works within the drum and is connected at one end to the scale plate. The drum is provided with a scale ring reading in divisions of 5 minutes from 0° to 70°, each degree and half degree being figured. The drum is read by means of a fixed reader (O). The backlash due to the wear of the threads on the screw and nut (which is in two parts) is automatically taken up by a compressor and spring within the drum.

The longitudinal level (P) is used in conjunction with the elevation drum for giving quadrant elevation.

The levelling screw (R) is attached to the stem, and is used in conjunction with the cross level (S) to bring the scale plate to a horizontal position when the wheels of the carriage are resting on uneven ground.

The axis pin (T) of the crosshead is set at an angle of 1° 50′ to the face of the scale plate to compensate for drift.

The cross and longitudinal levels are provided with reflectors so that the position of the bubbles may be observed below the height of the levels.

When not in use the sight is carried in a box secured to the rear of the limber.

TELESCOPE, SIGHTING, No. 2.

(Plates IX and X.)

Particulars.

Magnification	5 diameters.
Field of view	5 degrees.
Length overall	
Weight	

Description.

The telescope is of the ordinary erecting type, with an object glass and terrestrial eye piece.

The body is fitted with two gunmetal collars which accurately fit the bearings on the sight.

An adjustable diaphragm, carrying a needle pointer, is fixed between the third and fourth lenses of the eye piece.

Two marks, one on the body, and the other on the focussing ring, when approximated, show infinite focus.

The object glass is protected by a removable ray shade and shutter, and the eye piece is fitted with a dermatine eye guard.

To Focus the Telescope.

First focus the pointer by screwing the eye piece in or out until the pointer is clearly defined, then focus the object, *if necessary*, by revolving the milled ring at the object glass end. The focussing is correct when the eye can be moved to one side without the pointer going off the object.

Care of Telescope.

The telescopes are issued with all cells, joints, &c., tightly screwed up. The glasses should not be unscrewed except in cases of necessity, and then only by a competent person; they will seldom require to be cleaned on the inside. Cleaning should be done only with chamois leather, and great care must be taken that no oil or grease touches the glasses, as it can only be completely removed by the use of spirit.

If the object glass is unscrewed for cleaning purposes, the lenses should not be removed from the cell, as they may be easily reassembled incorrectly. The unscrewing of the object glass cell causes defective collimation, rendering the telescope useless, and necessitating re-collimation.

The focussing tubes should on no account be removed by any but a skilled person, specially appointed to do so.

The body of the telescope must not be cleaned or polished with anything except a dry cloth and a little oil or vaseline, care being taken that the lenses do not come in contact with any greasy substance. Even fingers, when apparently clean and dry, may leave greasy marks on the lenses which will impair the definition of the telescope more than dust.

General Remarks.

Telescopes as issued from Woolwich are tightly screwed up and accurately collimated and provided that none of the screw threads are unscrewed or tampered with, the collimation will remain as good as when first adjusted.

LIMBER, SIEGE.

(*Plate VIII.*)

The limber consists of a steel frame, and a limber box mounted on a second class axletree and two wheels, an axletree bed, and shafts, single and framed.

The frame consists of three futchels, connected to the axletree bed at the rear, and a splinter bar at the front. A footboard and platform board are fitted to the top of the futchels, a limber hook to the axletree bed, and two outriggers for 4-horse draught, to the splinter bar.

The axletree bed is of wrought iron, and with the axletree constitutes a beam of box girder section.

The wheels are 2nd class "C," No. 42,* 5 feet in diameter, double spoked, with a 3-inch tire, and removable pipe-box. The nave consists of two flanges, connected by 14 bolts; the pipe box passes through

* The No. 35A wheel will, in future, be supplied.

the flanges, and is secured to the inner flange by a ⅝-inch bolt with nut. A feather is fitted to the pipe box to engage with the inner flange, and so prevent the box from turning.

The shafts are one pair "near" and "off," and a pair of framed shafts; the "near" and "off" shafts pass through bands on the splinter bar; the former is secured by a pin to the inner futchel and the latter to the "off" axletree. The frame shafts are attached to the splinter bar. Fittings are provided for the attachment of a No. 1 or No. 2 engine draught connector. A certain number of carriages and limbers have been fitted with arrangements for travelling in series, and for this purpose a No. 2 connector will be used.

The limber is fitted to carry the "box, limber, siege, B.L., 6-inch 30 cwt. howitzer," and the following stores (*see* Packing diagram A) :—

	No.
Axes { felling, curved helve	1
Axes { pick	1
Boxes, dial sight, B.L., 6-inch 30 cwt. howitzer ..	1
Box, grease, 3 lb.	1
Brush, water, carriage	1
Buckets, water, G.S.	2
Blocks wood, brake { left	1
Blocks wood, brake { right	1
Connector, engine draught, No. 1*	1
Grease, lubricating .. .. lbs.	3
Hook, bill	1
Jack, lifting, Clerk's	1
Key, lock, in pocket	1
Kettles, camp	2
Lamp, siege (or lantern bull's eye) in box	1
Lever, compressing springs, No. 5	1†
Maul, G.S.	1
Ropes, drag, heavy (pairs)	1
Shovels, G.S.	2
Saw, hand, 26-inch, in case	1
Sight, dial, No. 4	1
Swingletrees, No. 1	3
Washers { drag, 1st class "B"	1
Washers { loop, 2nd class "C"	1

DIMENSIONS, &c.

Carriage and Limber.

	ft.	ins.
Height to axis of howitzer (from platform without wheel plates)	4	0
Length of { carriage and limber { with howitzer	23	1
Length of { carriage and limber { without howitzer ..	21	7
Length of { axletree { carriage	6	5
Length of { axletree { limber	6	3½
Length between axletrees (carriage and limber) ..	8	5
Greatest projection beyond track of wheels { carriage (each side) ..	0	7½
Greatest projection beyond track of wheels { limber (one side) ..	0	9

* No. 2 connector will eventually supersede the No. 1, but cannot be carried on the limber.

† Per 2 howitzers.

			ft.	ins.
Maximum width	carriage		6	5
	limber		6	4
Wheels	track	carriage, No. 8	5	2
		limber	5	2
	diameter	carriage, No. 8	5	0
		limber	5	0
Space required to turn in			31	0
Angle of	trail	(carriage on ground)—top side		37°
		(limbered up)—top side		21°
	lock			40°
Elevation				35°
Contents of	cradle buffers		6 quarts.	
	anchoring buffer		1 quart.	
Tonnage	for shipment	carriage and limber	8·825 tons.	
		carriage	5·59 ,,	
		limber	3·88 ,,	
	for transport	carriage and limber	14·97 ,,	
		carriage	7·85 ,,	
		limber	6·64 ,,	
Cradle, tonnage			0·835 ton.	

		cwt.	qrs.	lbs.
Weights	carriage (without wheels)	31	3	0
	,, (with ,,)	38	3	0
	,, packed	69	3	8
	limber (without wheels), empty	10	1	26
	,, packed	15	0	22
	carriage with limber, packed — on fore wheels	15	0	22
	carriage with limber, packed — on hind wheels	69	3	8
	wheel, 1st class, "B" (carriage) No. 8	3	2	0
	,, 2nd ,, "C" (limber)	2	0	18
	cradle (buffers filled)	12	1	26
	complete equipment behind team	85	0	2

Carriage Top.

Height to axis of howitzer (from pivot plate)	4′ 10″
Elevation	70°
Tonnage, for shipment	0·958 ton.
Weight	7 cwt. 0 qr. 0 lb.

BOX, LIMBER.

(Plate VIII.)

This box is of deal, with elm ends, and is fitted with nib irons and staples for securing it to the siege limber.

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It is internally arranged to carry the following stores (*see* Packing diagram A) :—

Article.	Number.	Where carried.
Bit, vent, 14-inch....	1	Lower tray
Box, obturating pads	1	In compartment
,, tube, friction T	1	
,, tallow	1	Bottom of box
Can, lubricating, No. 5	1	In compartment
Case, powder, metal-lined—Key	1	Lower tray
Chalk, white .... ozs.	4	
Clamps, tangent sight B	2	
Clinometer, large	1	In compartment
Cloths, sponge	10	
Cordage, tarred, spun yarn, hemp, 3-thread lbs.	2	Bottom of box
Discs, pad obturating { adjusting	2	In obturating pad box
Discs, pad obturating { protecting	3	
Driver, screw, G.S., 6-inch	1	Lower tray
,, ,, narrow, 2¼-inch (tools, electricians, large)	1†	
Dubbing (in tin box) .... lb.	1	Bottom of box
File, second cut, half-round, 8-inch	1	Lower tray
Handle, file, small	1	
Keys { adapter, 2-inch fuze hole	1	Lower tray
Keys { fuze, universal	2	
Keys { pump seating	1*	Bottom of box
Knife, clasp	1	Lower tray
Lanyards, firing, field, , Marks II or III	2	
Lever, lengthening spanners, No. 4	1†	Bottom of box
Lines { carpenter's	1	Lower tray
Lines { Hambro'....	1	Bottom of box
Marline .... lb.	1	
Measure hydraulic buffer	1*	
Oil, Rangoon .... pint	½	In oil can
Pads, obturating	3	In obturating pad box
Packings, ½-inch square section { length of 66 inches { cotton plaited lengths	1‡	
Packings, ½-inch square section { length of 66 inches { hydraulic ,,	1§	
Packings, ½-inch square section { length of 44 inches { cotton plaited ,,	2‡	
Packings, ½-inch square section { length of 44 inches { hydraulic ,,	2§	
Pins { keep, hinge bolt, cam lever	2	Lower tray
Pins { linch { 1st class	1	In compartment under tube box
Pins { linch { 2nd ,,	1	
‖Plates, preserving, bracket, fore sight	2	Lower tray
Plummet, laying	1	
Pocket, tube, land service	1	In compartment above tubes
Pliers, side cutting, 7-inch .... pairs	1	Bottom of box
Plugs { filling hole { anchoring buffer	1	Lower tray
Plugs { filling hole { cradle buffers	1	
Plugs { tube protecting piston tail rod	1*	
Reel, carpenters'	1	
Rimers, vent, T	2¶	Lid of box
Screws, metal, lubricating, 3/16-inch { boss head	1	Lower tray
Screws, metal, lubricating, 3/16-inch { thumb	2	
Sights, B.L., crossbar { fore { left	1	Upper tray
Sights, B.L., crossbar { fore { right	1	
Sights, B.L., crossbar { tangent	2	

* 1 per 4 howitzers or less.
† 1 ,, 2 ,, ,,
‡ When the buffer is filled with mineral oil.
§ ,, ,, ,, "fluid lifts and jacks."
‖ When not on howitzer.
¶ Includes 1 spare per 2 howitzers.

Box, Limber—*continued.*

Article.	Number.	Where carried.
Socket extending, worm spindle	1*	Bottom of box
Spanners, No. 193	1†	Bottom of box
Spanners, No. 265 (cut-off valve)	1	Bottom of box
Spanners, nut, tension bolt and pivot plug, No. 180	1†	Lower tray
Spanners, socket, No. 181	1†	In compartment
Spanners, hydraulic buffer, gland, floating piston No. 86	1‡	Bottom of box
Spanners, hydraulic buffer, gland, connecting pipe and capsquare screw and pivot plug, No. 81	1‡	Lower tray
Spanners, hydraulic buffer, plug, filling and connecting pipe, No. 82....	1	Lower tray
Spanners, hydraulic buffer, nut, tube, anchoring, No. 84	1†	Bottom of box
Spanners, hydraulic buffer, nut and glands, piston rod, anchoring, No. 83	1‡	Bottom of box
Spanners, hydraulic buffer, nut and gland, piston rod, No. 80....	1‡	Bottom of box
Spanners, hydraulic buffer, piston, floating, No. 87	1†	Bottom of box
Springs, catch, cam lever	1	Lower tray
Springs, clip, carrier ring	1	Lower tray
Springs, latch, ,, ...	1	Lower tray
Straps, tube box, long	1	With tube pocket
Tape, measure	1	Lower tray
Tallow, Russian .... lbs.	1½	In tallow box
Ties, linch pin	10	Bottom of box
Tubes, friction, T	50	In compartment
Tubes, ,, T, drill	1	Lower tray
Twine, whipping .... lb.	¼	Bottom of box
Vent, T, axial	1†	In compartment
Washers, packing, leather, anchoring buffer	2	Lower tray
Wrench, breech mechanism	1	In compartment

* Component of carriage.
† 1 per 4 howitzers or less.
‡ 1 ,, 2 ,, ,,

DIMENSIONS, &c.

Tonnage .. .. 0·239 ton.
Dimensions (overall) .. 4 ft. 2½ ins. × 1 ft. 5 ins. × 1 ft. 7¼ ins.

BOX, STORE.

This box is generally similar to the limber box, and one is allowed to every 10 howitzers or less number.

It is arranged internally to carry the following spare parts of the howitzer :—

Article	Number
Bolt, stop	1
Collars, actuating, T tube	2
Lever, cam, with bolt and pin	1
Links, actuating collar	2
Ring, carrier	1
Screw, breech	1
Springs, catch, cam lever	4
Springs, clip, carrier ring	4
Springs, latch, ,, ...	4
Wrench, breech mechanism	2

DIMENSIONS, &c.

Tonnage	0·235 ton.
Dimensions (over all) ..	4 ft. 2½ ins. × 1 ft. 5 ins. × 1 ft. 7 ins.

PLATFORM, SIEGE, DOUBLE-DECKED, MARK II.

The platform consists of two layers of 3-inch deal planks, the bottom layer being parallel to the line of fire, the upper layer at right angles to it. Under the bottom layer are placed three transverse planks (or transoms) similar to those in the top layer, as shown in the plate. Under the front is bolted an oak baulk, 9 inches square, to receive the eyebolts of the holdfast. The two layers of planks are secured to the transoms by 8-inch bolts, and to the front baulk by 14-inch bolts. A riband of deal, 6 ins. × 3 ins., is placed on top of the outer edges of the planks on each side of the platform, and bolted through to the transoms by three 12-inch bolts, and to the front baulk by an 18-inch bolt.

A thin washer plate for each bolt is placed under the pivot plate on top of the upper planks, and on top of the transoms under the bottom planks, which, by means of split keys passing through the bolts, prevent the bolts slipping down while the nuts are being screwed up.

A steel binding plate, 4 ins. × ⅜ ins., is attached to each outer side of the platform by thirteen ½-inch coach screws, 3 inches long.

The platform consists of the following parts :—

Item	Description		Number
Baulks, oak, 12 ft. × 9 ins. × 9 ins.			1
Planks, deal	12 ft. × 8½ ins. × 3 ins.		16
	12 ft. × 6 ins. × 3 ins.		2
	12 ft. × 8¾ ins. × 3 ins.		19
Plates, steel	6 ins. × 3 ins. × ⅛ in.	for 1¼-inch bolt (pivot plate)	12
		for 1-inch bolt	8
	12 ft. × 4 ins. × ⅜ in., with holes for 12 coach screws		2
	3 ft. × 3 ins. × ⅛ in. for four 1-inch bolts each		4
Bolts, square head, 1-inch diameter	18 inches long	with nut, washer, and split key	2
	14 ,, ,,		4
	12 ,, ,,		6
	8 ,, ,,		12
Cups for heads of bolts			24
Screws	coach, ½ in. × 3 ins.		26
	coach, ½ in. × 5 ins.		8
	iron, flat head, 1-inch, No. 12		108

Spanners (Nos. 156 and 185) are provided for use in laying down the platform.

HOLDFAST, PLATFORM SIEGE, DOUBLE-DECKED, MARK II.

The holdfast consists of an oak plank, to which are attached three eyebolts with tie rods ; these are connected by coupling nuts to similar tie rods and eyebolts attached to the front baulk of the platform.

The holdfast consists of the following parts :—

Plank, oak, 12 ft. × 12 ins. × 4 ins.	.. .. ..	1
Rods, tie { long ; with eyebolts, with collars and nut	..	3
Rods, tie { short ; ,, ,, ,,	..	3
Nuts, coupling, tie rods	.. ..	3

A tommy (No. 31, $1\frac{1}{2}$ ins. × 18 ins.) is provided for screwing up the coupling nuts.

PLATE, PIVOT, DOUBLE-DECKED PLATFORM, MARK II.

The pivot plate is a circular steel casting, with a hole bored in the centre to suit either the pivot plug or the boss of the radial arm. It is secured in position on the double-decked platform by 12 bolts which pass through the planks, and a circular steel holding-down plate on the underside of the platform.

DIMENSIONS, &c.

Weight (with plugs and bolts) ..	11 cwt. 1 qr. 10 lbs.
Tonnage	0·3475 ton.
Dimensions (over all)	4 ft. 1 in. × 10 ins.

ARM, RADIAL, PIVOT, DOUBLE-DECKED PLATFORM, MARK II.

The radial arm is a steel casting with a clip formed at the front end to grip the projecting rim of the pivot plate, and so prevent the arm lifting when firing. It is secured to the pivot plate by one clamping and two jamming screws ; the clamping screw can be readily removed to admit of the arm being placed in different positions to suit any angle of traverse.

DIMENSIONS, &c.

Weight	2 cwt. 0 qr. 5 lbs.
Tonnage	0·989 ton.
Dimensions (overall)	3 ft. $4\frac{3}{4}$ ins. × 1 ft. $7\frac{3}{4}$ ins. × $8\frac{1}{2}$ ins.

BUFFER, ANCHORING, B.L. 6-INCH 30-CWT. HOWITZER CARRIAGES.

(*Plate VII.*)

The anchoring buffer, which is connected to the carriage axletree by the stay, R, and to the radial arm, of the pivot plate by the crosshead, S, consists of a steel tube, T, glands, piston with a rod at each end, and volute springs, U ; the lower piston rod is connected to the crosshead, S, and the upper carries the volute springs, U ; the piston is thus stationary and the tube free to move with the carriage on recoil. On firing, the tube, T, is drawn with the carriage by means of the stay, R, thus checking the recoil and compressing the springs, U ; the energy thus stored up in the springs causes the carriage to return to the firing position.

When travelling the buffer is carried with the double decked platform.

PLATE, WHEEL, PLATFORM, SIEGE.

The wheel plates are of steel. One is placed under each wheel of the carriage to protect the upper layer of the platform.

Dimensions, &c.

Weight	1 cwt. 2 qrs, 4 lbs.
Tonnage	0·0094 ton.
Dimensions	6 ft. 0 in. × 1 ft. 6 ins. × ½ in.

PLANK, TRAVERSING, B.L. 6-INCH HOWITZER.

The plank is of oak 18 ins. × 4 ins. × 5 ft.; it is made in two pieces (each 9 ins. × 4 ins. × 5 ft.), which are connected by dowels and rivets. A steel plate is riveted to the upper surface of each plank to take the rub of the trail of the carriage. The plank is placed across the double-decked platform for the trail of the carriage (when used as a bed) to slide on, or placed under the centre of the trail.

PLUG, PIVOT, No. 18 (MARK II).

The pivot plug is used for securing the carriage trail to the pivot plate (page 21) when the carriage is used as a bed. The plug is a steel forging with a screw thread at its lower end for the "nut, pivot, plate, double decked platform" by which it is secured to the pivot plate. The upper end is formed to pass through the carriage trail which is secured to it by a nut, collar and 3 disc springs (No. 61).

CARE AND PRESERVATION.

(*See "Regulations for Magazines and Care of War Matériel."*)

Special Instructions not in the above mentioned Regulations.

Particular attention must be paid to the elevating gear to preserve it in good order. In replacing the friction plates care must be taken that steel does not come against steel, and that the faces of the plates are free from burrs, &c. Care must be taken that the plates are tightened just sufficiently to give the necessary "slip" for preventing injury to the gear.

The side arms, which are strapped to the underside of the bottom plate of the carriage, should invariably be removed before unlimbering.

Hydraulic Buffers (Cradle).

The buffers must always be full, or damage will be done to the carriage when the howitzer is fired. Always before firing is carried out it should be seen that the piston rod nuts are properly connected, and the cut-off valve of the pump screwed home. The howitzer should be placed at extreme depression, the filling hole plugs removed to see if oil shows at the filling holes, and if not, more oil must be poured

in until it does show, and the plugs replaced ; the howitzer should then be elevated to about 35° when in the lower carriage, and 70° when in top carriage ; if the buffers are quite full and no leakage at the glands, there should be little or no slip of the howitzer in the cradle ; a gradual slipping back of the howitzer indicates that a leakage is taking place at the gland packings ; if tightening up the glands will not stop the leak, the packings should be replaced.

To repack a piston rod gland.—Place the howitzer at point blank, tighten the elevating gear (to prevent the howitzer running down when forced back), take off the nuts securing piston rods, force the howitzer back about 7 inches in the cradle, and depress the howitzer (first securely fixing the howitzer so as to prevent it sliding forward), unscrew the gland, extract the defective packing and insert the new packing ; well tighten up the new packing with the gland, allow the howitzer to gently slide forward in the cradle, and replace the piston rod nuts.

To repack a tail rod gland.—Place the howitzer at point blank, secure the howitzer to the cradle by lashing (to prevent it sliding back when elevated), remove the nuts, P, of the tension bolts, the bar, O, the block, M, and the tube protecting tail rod, L, with springs ; place the howitzer at extreme elevation, unscrew the tail rod gland, E, take out the defective packing and insert the new packing ; well tighten up the packing by the tail rod gland, and replace the various parts.

To repack a floating piston gland.—This will be the same as for the tail rod gland, with the addition of removing the floating piston gland.

To insert new running-out springs.—Place the howitzer at point blank, remove the nuts, P, of the tension bolts, the bar, O, block, M, and tube protecting tail rod with springs, insert the spare tube (on which spare springs are compressed in readiness, so that a damaged spring can at once be replaced), and replace the various parts.

To compress running-out springs on tube protecting tail rod.—Place the octagon formed on the end of the tube in the fitting provided for it on the carriage, near the trail eye bracket, remove the damaged spring or springs and replace by new (first well greasing the parts where friction is set up), place the bush compressing springs, N, over the tube, and screw in the plug, N, with the lever provided, until it will go no further ; the compression given will be about 3¾ inches.

To tighten the floating piston and tail rod gland.—Place the howitzer at extreme elevation, first lashing the howitzer to the cradle to prevent it sliding back. Tighten the floating piston gland with the spanner, No. 86. Tighten the tail rod gland by turning the protecting tube with the "lever, compressing springs," the floating piston being held by a spanner.

Before performing this operation, the nuts on the tension bolts should be slackened to permit the strain due to the compression of the springs being taken by the plug, N, and afterwards re-adjusted (*see* below).

Anchoring Buffer.

Removal of brake bar.—To facilitate the use of the spanners for tightening the glands, the brake bar, which is pivoted to the front transom of the carriage, may be removed if found necessary.

Always before firing it should be seen that the buffer is full of liquid and properly connected to the radial arm. If the buffer leaks

at the gland and tightening up will not stop it, the glands must be repacked.

To repack the front gland.—Disconnect the crosshead of the piston from the radial arm, unscrew the nut retaining volute springs, pack the buffer up to a suitable height, draw out the piston rod to its full extent, unscrew the gland, take out the defective packing and insert the new packing, well tighten up the new packing with the gland and replace the parts.

To repack the rear gland.—Remove the buffer from the stay; this is done by disconnecting the crosshead from the radial arm and piston rod, unscrewing the nut retaining volute springs and nut securing tube, removing the volute springs, and placing the piston rod so that each end projects an equal distance. The whole can then be lifted bodily out of the stay. The gland can then be unscrewed, the defective packing removed and new packing inserted, and the buffer replaced.

Tension Rod Nuts.

Care must be taken in replacing the nuts, P, of the tension bolts that they are screwed up until the bush, N′, moves from the plug, N, about $\frac{1}{10}$ of an inch, to ensure the strain due to the compression of springs being taken by the block, M and not by the plug, N.

If the howitzer does not return to the firing position, the running-out springs should be further compressed; this can be done by screwing up the nuts P, of the tension bolts.

Leakage.

If the packing in the glands is in good order and the buffers are full, there should be little or no "slip" of the howitzer in the cradle, and if this should at any time exceed 1½ inches, leakage exists; a dripping will generally betray its whereabouts.

Leaks may occur at (1) the piston rod gland; (2) the floating piston gland; (3) the tail rod gland.

Leakage at (1), (2) and (3) will be observable by the liquid dripping from between the piston rod and gland, the floating piston and gland, and (when the howitzer is depressed) from the air hole in the plug N, compressing springs.

When the glands are in proper working order, there should be no leakage. By noting where the liquid issues, it will be known what gland to screw up. A lengthening lever is supplied for use with the spanners for tightening the glands.

Two holes are drilled in the plug, N, compressing springs, the one near the edge for lubricating the bush, N′, when compressing the running-out springs, and the other for admitting air into the tail rod of the piston; this air hole should always be kept free from clotted oil and dirt, and in placing the tail rod with springs in position, it should always be in the lowest position.

The plug N is stamped "TOP" on the side opposite to the air hole so as to ensure the air and leak hole being at the lowest point.

The packing for the cradle and anchoring buffers will be as follows:—

"Packing, cotton plaited, ½ inch square."—When the buffers are charged with mineral oil.

"Packing, hydraulic, ½ inch square."—When the buffers are charged with "Fluid, lifts and jacks."

"PUMP RUNNING UP."

The pump is fitted with a cut off valve, which must always be closed before firing. The closed position of the valve is indicated by a line engraved on each square of the valve screw which comes flush with the top of the gland when the screw is home.

INSTRUCTIONS FOR TESTING AND ADJUSTING No. 4 DIAL SIGHT, AND CROSS BAR SIGHTS OF HOWITZER.

Any adjustment required must be carried out by an armament artificer.

Before any of the following operations are carried out the carriage should be placed on a platform, or on hard ground, and the howitzer levelled by means of a clinometer, and a straightedge, placed in the bore.

These instructions are based on the assumption that, when the howitzer is level and the elevation indicator drum set at zero, the degree scale plate is also level longitudinally. A slight error in this latter respect is unimportant, and no means of adjustment is provided.

1. *The bubble of the longitudinal level should be in the centre of its run when the elevation indicator drum is at zero.*

Test.—Set the elevation indicator drum at zero. The bubble of the longitudinal level should be in the centre of its run.

Adjustment.—Bring the bubble to the centre of its run by means of the capstan headed nuts.

2. *The bubble of the cross level should be in the centre of its run when the top bearing surface of the degree scale plate is horizontal.*

Test.—Set the elevation indicator drum at zero, and the reader plate at 90°. Place a clinometer, set at zero, on the top surface of the degree scale plate, and level the clinometer by means of the cross levelling screw until the bubble is in the centre of its run. The bubble of the cross level should be in the centre of its run.

Adjustment.—Bring the bubble to the centre of its run by means of the capstan headed nuts.

3. *The trunnion bearings of the telescope carrier should be horizontal when the degree scale plate is horizontal.*

Test.—Suspend a plumb line about 20 yards from the front of the howitzer. Clamp the reader plate at zero. Traverse the howitzer until the pointer of the telescope is on the plumb line. Bring the bubble of the cross level central by means of the cross levelling screw. Slacken the thumb nut which clamps the telescope carrier to the trunnion bearing. The pointer of the telescope should remain on the plumb line when the telescope carrier is elevated or depressed (without using the elevation indicator drum).

Adjustment.—Adjust the bearings for the trunnions of the telescope carrier by scraping.

4. Collimation.—*The optical axis of the telescope should coincide with the mechanical axis.*

Test.—Select a well defined object at a distance of not less than 400 yards. Loosen the hinged caps of the telescope carrier

slightly. Lay the pointer of the telescope on the object, and revolve the telescope in its bearings. The pointer should remain on the object.

Adjustment.—Remove the breech end of the telescope, and the cover which protects the diaphragm screws, and replace the breech end. Revolve the telescope, carefully noting the direction of the error. With the tommy provided for the purpose, draw the pointer in the required direction by loosening and tightening the opposite screws of the diaphragm, carefully revolving the telescope after each adjustment until the pointer remains on the object. Replace the diaphragm cover.

5. *The line of sight through the open sights on the caps of the telescope carrier should be parallel to the optical axis of the telescope.*

Test.—Lay the pointer of the telescope on the object used in test "4." The fore and hind sights on the telescope carrier should be on the same object.

Adjustment.—File the fore and hind sights until correct.

Alignment Tests.

In order to carry out the tests for alignment, it is necessary to obtain a line of sight along the axis of the bore of the howitzer. A point at the muzzle is obtained by stretching two fine cords along the vertical and horizontal axis lines cut on the muzzle of the howitzer, their point of intersection being on the axis line. The axial vent is used as a sighting hole at the breech end. Select a clearly defined object 5,000 yards away to lay on, and lay the bore of the howitzer on this point.

Cross Bar Sights.

6. *Test.*—Set all sliding leaves at 3 on the main scales, and the deflection scale of the hind sight at zero. The acorn of the foresight should be on the object when viewed through the notch of the hind sight.

Adjustment.—If great accuracy is required, move the deflection leaf of each sight until the sights are layed on the object; erase the arrow on the leaf and remark it opposite 3 on the main scale.

7. *Test for straightness of the cross bar.*—Move the sliding leaves to 6 on the main scale. The line of sight should still fall on the object.

Adjustment.—Adjust the lower of the two cross bars until the line of sight is correct. This adjustment should not be carried out unless absolutely necessary.

Dial Sights.

8. *Test.*—Set the elevation indicator drum, deflection and direction nuts, and the reader plate, at zero, and the index arrow on the telescope carrier to coincide with the pointer on the trunnion bearing. The pointer of the telescope should be on the object.

Adjustment for error in direction.—If the pointer of the telescope is above or below the object, slacken the thumb nut which secures the telescope carrier in position. With an ordinary ⅜ inch spanner slacken the locking nuts on the adjusting screws in the sight bracket attached

to the cradle of the carriage (page 10). With spanner No. 263 adjust the bush in its socket by means of the adjusting screws until the pointer of the telescope is on the object. The screws must be tightly clamped on the lug of the bush before this operation is completed. Tighten up the locking nuts.

9. In cases where not more than 1° of error exists, slacken the clamping nut of the reader plate. Move the telescope and carrier until the pointer of the telescope is on the object. Tighten up the clamping nut on the reader plate, and adjust the positon of the reader so that the arrow coincides with zero on the degree scale plate.

10. *For vertical error.*—If the arrow on the telescope carrier does not coincide with the pointer on the trunnion bearing after adjustment for direction is completed, erase the arrow on carrier and re-engrave it to coincide.

Tests and adjustments Nos. 8 and 9 should be carried out with the sight in each of the two sight brackets.

AMMUNITION.

CARTRIDGES.

Cartridge, B.L. 6-inch 30 cwt., Howitzer, 1-lb. 12-oz. Cordite, Size 5.

(For use with heavy shell in Mark I Howitzers.)

(Plate XI.)

The Mark IV cartridge consists of a core and three rings of cordite, each being contained in a shalloon bag.

The core consists of a 10-oz. bundle of cordite with a 4-oz. ring of cordite round one end to form the base.

The rings which consist of 2 oz., 4 oz. and 8 oz. of cordite respectively are fitted over the core and secured to it by pieces of silk or shalloon braid.

The cartridge has an igniter consisting of 12 drams of S.F.G.[2] powder contained in an annular recess formed by two concentric rings of sewing in the bag at the base.

The form and dimensions of the cartridge are shown on Plate XI.

The Mark III cartridge differs from the previous pattern in having an igniter consisting of 2½ drams of guncotton yarn.

The Mark II cartridge is also similar but has an igniter of 12 drams R.F.G.[2].

Cartridge, B.L. 6-inch, 30 cwt., Howitzer, 1-lb. 15½-oz. Cordite, Size 5.

(For use with heavy shell in Mark I Howitzers.)*

This cartridge consists of the 1-lb. 12-oz. cartridge with the addition of a 3½-oz. ring of cordite. The Mark II cartridge has an igniter consisting of 12 drams of S.F.G.[2] powder and the Mark I of 2½ drams of guncotton yarn.

CARTRIDGE, B.L., 6-INCH, 30 CWT., HOWITZER, 2-LB. 8½-OZ. CORDITE M.D., SIZE 4¼, MARK I.

(For use with light shell in Mark I Howitzers.)*

This cartridge is similar to the 1-lb. 12-oz. cartridge, but the core consists of 15½ oz. of cordite and the three rings of 3½, 8½ and 13 oz., respectively.

The igniter consists of 12 drams of S.F.G.[2] powder, except some of earlier make which are of R.F.G.[2] powder.

CARTRIDGE, B.L., 6-INCH, 30 CWT., HOWITZER, 1-LB. 3-OZ. CORDITE M.D., SIZE 4¼.

(For use with star shell in Mark I Howitzers.)*

This cartridge consists of the core and 3½-oz. ring of the 2-lb. 8½-oz. cartridge.

CARTRIDGE, B.L., 6-INCH, 30 CWT., HOWITZER, 1-LB. CORDITE, SIZE 5.

(For use with star shell in Mark I Howitzers.)

This cartridge consists of the core and 2-oz. ring of the 1-lb. 12-oz. cartridge.

CARTRIDGE, B.L., 6-INCH HOWITZER, 5-LB. BLANK L.G., MARK II.

This cartridge is made of No. 1 class silk cloth choked with silk and having two hoops of silk or shalloon braid.

Length not to exceed 6·5 inches.

Diameter not to exceed 6 inches.

DRILL CARTRIDGES.

The drill cartridges are made up similar in arrangement to the cartridges which they represent.

The core is of wood covered with leather and the rings of string bound with leather.

The rings are secured to the core by leather laces.

PROJECTILES.

Description.	Howitzer for use with—	Diameter not to exceed—		Length.	Bursting Charge.		Weight Filled and Fuzed.
		Body.	Band.		Nature.	Weight.	
	Mark.	Inches.	Inches.	Inches.		lbs. ozs.	lbs. ozs.
Service Ammunition.							
Shell, B.L., common lyddite, 6-inch howitzer, light, Mark I	I*	5·97	6·12	22·66	Lyddite	14 7	100 0
†Shell, B.L., common lyddite, 6-inch howitzer, heavy, Marks I, II, III	I or I*	5·97	6·12	27·08	Lyddite	18 8	122 9
Shell, B.L., star, 6-inch howitzer, Mark I....	I and I*	5·97	6·12	17·69	R.F.G.[2]	Drams. 10	57 4¾
Service Ammunition issued only when specially ordered.						lbs. ozs.	
Shell, B.L., Q.F. or Q.F.C., shrapnel, 6-inch, Marks II, IV, V	I	5·97	6·12	18·925	R.F.G.[2]	0 10½	100 8¼
Shell, B.L., Q.F. or Q.F.C., shrapnel, 6-inch, Marks V*, VI, VI*, VII, VIII, IX	I*	5·97	6·33	18·582	R.F.G.[2]	0 10½	100 13¼
Shell, B.L., shrapnel, 6-inch howitzer, light, Mark I	I*	5·97	6·12	19·622	R.F.G.[2]	0 10½	100 0

† Obsolete when existing stock is used up.

NOTE.—The particulars given are of the latest Mark of projectiles quoted.

PROJECTILES—*continued.*

Description.	Howitzer for use with—	Diameter not to exceed—		Length.	Bursting Charge.		Weight Filled and Fuzed.
		Body.	Band.		Nature.	Weight.	
	Mark.	Inches.	Inches.	Inches.		lbs. ozs.	lbs. ozs.
Practice Ammunition.							
Shell, B.L., 6-inch howitzer, heavy, iron, Marks I, II, III, IV	I	5·97	6·12	....‡	L.G.	9 7	122 9
Shell, B.L., 6-inch howitzer, light, iron, Mark I	I*	5·97	6·12	19·622	L.G.	4 5¾	100 0
Drill.							
Shell, B.L., drill, 6-inch howitzer, Mark II	I and I*	5·93	5·97	27·225	....	....	....

‡ Left to contractor.

NOTE.—The particulars given are of the latest Mark of projectiles quoted.

LYDDITE SHELL.

(*Plate XII.*)

Mark I light.—These shells are to the form shown on Plate XII. A groove (undercut to prevent the band stripping) for a copper driving band is turned 1·2 inches from the base of the shell, with three waved ribs to prevent the band turning on the shell. Three chisel cuts are made across the ribs to allow the air to escape when the band is pressed on. The driving band is 1 inch wide and plain except for the front slope which is serrated to ensure the band gripping the rifling when the shell is rammed home. The head of the shell is struck with a radius of 2 diameters. The nose of the shell is screwed to receive a gunmetal bush, the interior of which is screwed to the G.S. fuze hole gauge. The interior of the shell is varnished.

Mark III heavy.—These shells differ from the "light" in being longer, in having slightly thicker walls, and in having a different form of driving band. The shell has a driving band 1·75 inches wide, with two cannelures and the front slope serrated. The undercut groove for the band is 0·67 inches from the base and has four waved ribs with three chisel cuts across them to allow the air to escape when the band is pressed on.

The Mark II differs only from the Mark III in the groove having five straight ribs with chisel cuts to prevent the band turning on the shell.

The Mark I is similar to the Mark II except that the groove for the driving band is not undercut.

COMMON SHELL.

These shell are of iron and are intended for practice purposes. The dimensions, &c., of the "light" and "heavy" shell are given in the table on page 29.

The head of the "heavy" shell is struck with a radius of 2 diameters, and in the case of the "light" with a radius of 1½ diameters.

The Mark I light shell has the same groove and pattern of driving band as that described for the Mark I "light" lyddite shell.

The Marks IV, III and II shell are of the same dimensions; they have the same pattern driving band as described for the Mark III "heavy" lyddite.

The groove for the band is ·67 inches from the bases and in the case of the Mark IV has four waved ribs and three chisel cuts; that for the Mark III has five straight ribs. Mark II is the same as the Mark III except that the groove is not undercut.

The Mark I shell is similar to the Mark II, but has thinner walls.

SHRAPNEL SHELL.

(*Plate XIII.*)

The Mark I "light" shell is of steel to the form shown on Plate XIII.

The head is forged separately being secured to the body of the shell by 6 steel screws and 6 twisting pins. It is screwed to take a metal fuze hole plug and is fitted internally with a wood block.

The body of the shell is recessed in the base to take the tin cup containing the bursting charge, and also a steel diaphragm on which the balls rest. The walls are ·5 inch thick.

A metal tube, screwed into the fuze hole plug at one end and into the steel diaphragm at the other, conveys the flash from the fuze to the bursting charge.

The interior of the shell contains a wood block, about 905 mixed metal balls and resin.

An undercut groove is turned near the base of the shell to take a copper driving band, the groove having three waved ribs in it to prevent the band turning on the shell. The driving band is of the same pattern as that for the Mark I "light" lyddite shell.

The Mark IX, B.L., Q.F. or Q.F.C. shell differs from the Mark I "light" in the length and thickness of the walls (·65 inch). It is filled with 453 balls, 14 per lb. A groove for a copper driving band (which is undercut to prevent the band stripping) is turned ·67 inch from the base with four waved ribs, the latter to prevent the band turning on the shell. Three chisel marks across the ribs allow the air to escape when the band is pressed on.

The driving band is 1·75 inches wide and has a cannelure and gascheck.

The Mark VIII only differs from the Mark IX in the groove for driving band having five straight ribs, the latter having chisel cuts across them to prevent the band turning on the shell.

The Marks V, V, VI, VI** and *VII* have thinner walls (·55 inch), are 18·925 inches long and contain 518 balls.

Marks VI, VI* and VII have the same driving band as that described for the Mark VIII, but in the Mark VI the groove for driving band is not undercut. Mark V has a driving band with the front slope of the band slightly grooved and two undercut cannelures, Mark V* is the same shell fitted with the band described for the Mark IX.

The Mark IV has thinner walls (·5 inch) and 536 balls, otherwise the same as Mark V.

The Mark II is 18·2 inches long and has walls 1·1 inches thick. It is filled with 255 balls and has a similar driving band to that described for the Mark V.

STAR SHELL.

(*Plate XIV.*)

The body of the shell is made of steel, and has a recess in the base for the reception of a bursting charge of 10 drams of R.F.G.[2] powder in a shalloon bag threaded with quick match. At a distance of ·67 inch from the base an undercut groove for a copper driving band is turned with four waved ribs. The band is of the same pattern as that described for the Mark III "heavy" lyddite shell.

The head is fitted with a metal fuze hole socket screwed to the general service fuze hole gauge, and contains a wood block. The head is attached to the body of the shell by six brass screws and six twisting screws. The fuze socket fits into the end of a wrought iron central tube which is in two pieces connected by a screwed gunmetal junction piece, containing a shalloon primer of 70 grains R.F.G.[2] powder, which is kept in position by a piece of copper wire passed

through the central tube. The tube is pierced with fireholes (to admit the flash to the priming of the stars) and is screwed into a disc of wrought iron at the base of the shell.

The shell contains 12 stars in two tiers, six in a tier; each tier is supported by a corrugated steel lining (in two parts) to prevent them being crushed. A perforated iron plate is placed between the two tiers.

BAGS, BURSTER, B.L. COMMON, 6-INCH HOWITZER.

These bags are made of dowlas with neck of shalloon and threaded with a piece of twine for choking. They are stencilled to denote the nature of the shell with which they are used, *i.e.*, whether for "light" or "heavy" common shell.

DRILL SHELL.

The Mark II shell is of iron to dimensions stated in Table on page 30.

The nose is bored and screwed to take the fuze hole plug, which is screwed internally to the general service fuze hole. Two grooves are turned on the body to receive gunmetal bands to prevent injury to the rifling. The base is bored out for a coned cast steel plug which is formed with a bridge as a means of extraction. A groove is turned at the junction of the plug and shell to receive a grummet of 2-inch tarred rope, which prevents the shell being rammed too far. The grummet is kept in position by the head of the plug, which is 6·3 inches in diameter. The shell is weighted with sand to 118 lb. 8 oz.

EXTRACTOR, DRILL SHELL, No. 1.

This consists of a wood stave, 1·75 inches in diameter, grooved spirally at one end, and fitted at the other with a steel hook, which fits over the bridge in the base of the drill shell.

FOR INSTRUCTIONS RESPECTING THE PREPARATION, &c., OF PROJECTILES, *see* "REGULATIONS FOR MAGAZINES AND CARE OF WAR MATÉRIEL."

FUZES.

(*Plates XV to XIX.*)

Fuze	Use
Percussion, direct action, with Cap, No. 1.	With lyddite shell for service. With common shell for practice.
Percussion, direct action, delay No. 10.	For service or practice when specially ordered.
Percussion, direct action, Impact, No. 13.	With lyddite shell for practice.
Time and percussion, middle, No. 54.	For shrapnel shell.
Time and percussion, No. 62 ..	For shrapnel shell.
Time, 15 seconds, No. 25 ..	For star shell.

Fuze, Percussion, Direct Action, with Cap, No. 1, Marks I*, I**, II and III.

(*Plate XV.*)

Mark II.—This fuze is intended to act on direct impart; it cannot be depended on to act on graze unless fired at angles of elevation of 10° and upwards.

It is made of gunmetal, turned all over, and screwed below the head to fit G.S. fuze hole. The interior is bored out at the lower end for the powder charge and closed with a screw base plug. A recess in the upper part of the fuze is charged with detonating composition, and the holes communicating with the magazine are filled with powder priming. The fuze is fitted with a steel needle, passing through and secured in a copper suspending disc, ·032 inch thick. The lower part of the fuze is filled with 75 grains of pistol or R.F.G.[2] powder. A gun metal cap, having a T-shaped slot cut out in each side to fit over the projecting pins in the head of the fuze, is secured over the top.

On striking any object the suspending disc is driven in and the needle is forced against the detonating composition, thereby exploding the fuze.

Mark III differs from Mark II in having a removable detonator, a single-pointed needle, and a slightly smaller magazine, containing 65 grains of powder.

Marks I* and I** fuzes may also be used.

Weight .. .. 7¾ oz.

These fuzes are issued, one in a tin cylinder, for this equipment.

Fuze, Percussion, Direct Action, Delay, No. 10, Mark III.

(*Plate XVI.*)

This fuze is generally similar to the "fuze, percussion, direct action, with Cap, No. 1, Mark II," but has a delay arrangement in addition, consisting of a channel filled with compressed mealed powder, the top being primed with quickmatch and the bottom communicating with the magazine. It differs externally in being slightly longer.

On impact the disc with needle is driven in on the detonator; the flash is then led to the delay arrangement by means of the quickmatch. The pressed pellet of mealed powder, the burning of which gives the delay, is thus ignited, and burns about 5 seconds, then ignites the fuze magazine of loose powder which fires the shell burster.

Weight .. .. 10 oz.

These fuzes are issued one in a tin cylinder.

Fuze, Percussion, Direct Action, Impact, No. 13, Mark IV.

(*Plate XVII.*)

This fuze, which is of gunmetal, is screwed externally below the head to the G.S. gauge.

The head is turned and has a projection on each side to engage the cap with which the fuze is furnished.

The body is bored throughout its length and contains a steel hammer, detonator plug containing detonator, and 16 grains of R.F.G.[2] powder.

The hammer is held in suspension over the detonator by a steel shearing pin which passes through the side of the fuze and is spun in.

The detonator plug has a recess in the top to take the detonator and has also four conical holes filled with pistol powder.

The detonator, consisting of 1 grain of R.F.G.[2] mealed powder is secured in the plug by a brass screwed washer.

The fuze is closed at the head by a screwed ring with a brass disc spun in, and at the base with a brass washer spun in.

The cap has a ⊤-shaped cut in each side of its rim to lock on the projections on the body where it is further secured by a safety pin. The cap has also a square keyhole in the top to take the fuze key for screwing the fuze into the shell.

The fuze requires no preparation beyond removing the safety pin and cap at the moment of loading.

On impact the hammer is driven in shearing the steel pin and igniting the detonator, the flash passing through the detonator plug into the magazine.

Mark IV is the latest mark of this fuze; the earlier Marks, I**, II* and III* have been altered to conform with Mark IV.

Weight		
	of fuze	10 ozs.
	of cap	3 ozs.

Fuze, Time and Percussion, Middle, No. 54, Mark III.

Mark III.—The body is hollow, and has a stem on its upper side. Round the base of the stem an annular groove is cut, from which a hole is bored to the side of the body for the gas to escape through. The sides of the body are pierced with three fire holes; the top of the body is screwed to receive a hexagonal cap. Between the cap and the dome fits a brass washer with feathers fitting into slots on the stem of the body; it is to prevent the dome from turning with the nut and altering the setting of the fuze when the cap is screwed tight.

The *percussion pellet* has a slot in the side for the safety pellet and brass ball to fall into, when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a charge of F.G. powder, and then the needle plug which is screwed in; the latter is perforated with six fire holes and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet to prevent the latter turning in flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet, and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball and is suspended in the body by a thin copper wire passing through it. A hole is also bored in the upper part of the pellet and body of fuze for the safety pin to pass through.

The *base plug* has a conical hole bored in it, and is closed at the bottom by a shalloon disc and brass washer spun in; it contains a perforated pellet of pressed powder, secured by a brass washer spun over on top. The plug is fixed by stabbing in three places.

The *composition ring* has an annular groove round it for the composition; a projection on the upper side contains the hammer with steel needle, suspended by a ·022-inch wire, and a detonator under it for lighting the composition in the ring. The hammer is also secured by a safety pin passing under it, the hole in the ring left by its withdrawal being closed by a brass pellet with a spiral spring above it. The ring is barrel shaped outside to facilitate the setting of the fuze, and is kept in position by three projections on the side, which fit closely round the stem of the body. Two holes are bored through the top of the ring at the commencement of the composition and covered with paper. The ring is graduated from 0 to 50, and reads as quarter units, and has an arrow head between the last graduation and the commencement to show the position of safety.

The body has an arrow head or black triangular mark on it for setting the fuze, opposite which is a hole from the surface to the percussion arrangement, filled with powder, for communicating the flash when the composition has burnt to it.

A small hole is made in the side to receive the pin in the semicircular arm of the universal fuze key when screwing the fuze into the shell.

The fuze is stamped T on the ring close to the "time" safety pin, and P on the body close to the "percussion" pin to distinguish them. The time safety pin has a scarlet loop. If the fuze is required to act as a percussion fuze only, the P pin should be withdrawn, if as a time fuze only, the T pin, and if as a time and percussion fuze, both pins.

To set the time arrangement of the fuze, the nut is loosened with the "key, fuze, universal," and the ring moved round till the required graduation is opposite the arrow or black triangular mark on the body, the nut is then tightened, great care being taken to see that it is screwed down as tightly as possible.

The time of burning of the fuze at rest, when set at 30, or full length, is 16 seconds.

Action.—On discharge, if the "time" safety pin has been withdrawn, the hammer sets back, shearing the suspending wire, and fires the detonator, which lights the end of the ring of composition; this burns until the channel communicating with the lower part of the fuze is reached, when the flash passes down it and fires the detonator and magazine in the percussion arrangement.

If the "percussion" pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug in the shell.

Weight .. .. 1 lb. 4 ozs.

No. 54 fuze will be superseded by No. 62 when existing stock is used up.

†Fuze, Time and Percussion, No. 62 (Marks I and II).

(*Plate XVIII.*)

The Mark II fuze principally consists of the following parts, which are made of gunmetal, except where otherwise stated :—Body, detonator plug with detonator, percussion pellet with needle plug and steel needle, brass safety pellet, brass ball, base plug, time composition rings (upper and lower), brass springs, dome, brass washer, cap, two safety pins, and leather washer.

The *body* is screwed at the lower end to G.S. fuze hole gauge, and bored from the bottom to receive the percussion pellet and base plug. Two holes are bored beyond the recess for the percussion pellet, one for the detonator plug, the other for the safety pellet. The hole bored for the detonator plug is continued horizontally to form a small magazine, which is filled with fine grain powder; the hole then leads upwards to join the time rings, and contains perforated pellet powder. The stem of the body is fitted with two studs to engage corresponding slots in the upper ring to prevent it revolving and is screwed to take the cap, two featherways being cut in top end of stem to receive corresponding feathers on the brass washer over dome. A small tablet of fine white paper is secured with shellac to the body of the fuze over the perforated powder pellet, and over this tablet are two washers one of fine white paper and the other of cloth, which are secured with shellac, a hole being cut through the washers and tablet immediately over the powder pellet; similar tablet, pellet and washers exist on top of the lower time ring.

The *detonator plug* is screwed on the outside to fit the hole prepared for it, and contains a detonator, which consists of a copper cap with fire holes filled with 3½ grains of detonating composition, with a ·005-inch brass disc under the composition and a tinfoil disc over it, to prevent the composition working through the holes.

The *percussion pellet* has a slot in the side for the safety pellet and brass ball to fall into when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a perforated powder pellet (5½ grains), having under the latter a muslin disc and brass washer, and over it 1 grain of fine grain powder, and then the needle plug, which is screwed in; the latter is perforated with six fire holes, and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet, to prevent the latter turning in flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball, and is suspended in the body by a thin copper wire which passes through it. A hole is also bored in the body and upper part of pellet for the percussion safety pin; the hole in the body left by the removal

† This fuze is only suitable for use in the Mark I* howitzer with the 2 lb. 8½ oz. and 2 lb. 5 oz. charges.

of the safety pin is closed by a brass pellet having above it a spiral spring in compression.

The *base plug* contains perforated pellet powder; over the latter are two discs, one paper, the other muslin, and a brass washer, and under the pellet a shalloon disc and a brass washer. The base of the fuze is closed by the plug, which is made secure by being stabbed in three places.

The *composition rings* have each a channel, which is lined with asbestos paper, for the fuze composition, and a hole is provided which allows the gas direct escape outside; this escape hole is lightly closed by means of a brass disc covered without by Pettman cement.

The upper ring has a chamber which contains a hammer with steel needle; the hammer is suspended by a ·022-inch copper wire, a safety pin also passes through the ring and under the hammer; the hole in the ring left by the withdrawal of the pin is closed by a pellet of brass as mentioned above for the percussion safety pin (*see* Safety pellet). Under the needle is detonating composition and mealed powder. The composition channel on the under side and the chamber are connected by a lighting hole, the composition being roughened at the lighting point to assist ignition. The outside of the ring is graduated from 0 to 60 each division being sub-divided into halves and quarters, with an arrow point on bridge portion to mark the position of safety, *i.e.*, when the arrow and pointer are in the same vertical plane. The interior of the ring has two slots which engage studs on the stem to prevent the ring revolving.

The lower ring has a composition channel similar to the upper ring. The outside of the ring is barrel shaped and milled to facilitate setting, and fitted with a setting pointer of cupro nickel.

The *dome, brass washer* and *hexagonal cap* are put on the fuze in the order here given.

The dome is of sheet brass, stamped into shape, and covers the time lighting arrangement.

The washer has two feathers, which engage in featherways cut in the stem of fuze; its object is to prevent the dome from turning and altering the setting of the fuze through friction when screwing down the cap.

The cap must be clamped tightly; this is most important; if not done the composition may explode instead of burning. Care must also be taken when clamping not to alter the setting.

The fuze is stamped T on the upper composition ring close to the time safety pin, and P on the body close to the percussion safety pin. The pins are each provided with a whipcord becket or loop, the T one being scarlet, and that of P tarred.

The openings in the fuze are coated with Pettman cement to exclude damp.

A leather washer in a groove above the fuze hole thread makes a tight joint.

The fuze should be set *before* the safety pins are withdrawn.

To set the time arrangement, the cap is loosened with the "Key, fuze universal" and the ring moved round until the graduation ordered and the pointer coincide; the fuze is then clamped by screwing down the cap as tightly as possible, care being taken that the ring and dome have even bearings, and the setting has not shifted.

If the fuze is required to act as a percussion fuze only, the P pin

should be withdrawn and the T pin left in position; otherwise both pins should be withdrawn, but this should not be done till the moment of loading.

Action.—On discharge, if the "time" safety pin has been withdrawn, the hammer sets back shearing the suspending wire, and igniting the detonator and the composition in the upper time ring, which burns until it reaches the position indicated by the setting pointer, the flash then passes through a hole in the lower ring to the composition in its under surface and burns back in the opposite direction until it reaches a hole in the body (which is directly under the zero point of the upper ring) where it flashes down through the radial magazine, percussion detonator and pellet, and base plug, into the shell.

If the "percussion" pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug into the shell.

The time of burning at rest is about 35 seconds.

Weight of Mark II fuze (about) 1 lb. 9¾ ozs.

Mark I fuze differs from the Mark II principally in the following particulars :—

(1) The dome is thinner.
(2) The stem of the body is thinner and slightly shorter.
(3) It has two setting pointers, one of which is fixed to the lower time ring, and the other to the body under the rings.
(4) The upper time ring is barrel shaped on the outside to facilitate setting, and is graduated from 0 to 30.
(5) The lower time ring is flat on the outside and graduated from 30 to 60.
(6) The fuze is slightly lighter, the average weight being 1 lb. 7 ozs.

Fuze, Time, 15 Seconds, No. 25, Marks I and II.

(*Plate XIX.*)

The *Mark II* fuze is made of aluminium, and consists of the following principal parts, viz., body, time ring, cap, safety pin, detonator pellet with detonator, stirrup spring, needle plug, magazine, bottom plug and leather washer.

The lower portion of the *body* contains the magazine and the upper portion forms a stem and contains the detonator pellet with detonator and the needle plug. The shoulder of the body has a black mark to coincide with an arrow on the time ring, when set at safety.

The *time ring*, which is graduated from 0 to 44, is fitted round the exterior of the stem.

The *cap* fits over the time ring, on top of a steel spring washer, and closes the head of the fuze; it is secured when in position by a steel keep screw.

A *safety pin* provided with a loop of red cord, passes through the detonator pellet and the cap.

The *detonator pellet* is suspended by the safety pin and a stirrup spring, which is kept in position by its two clips.

The *magazine* contains 45 grains of R.F.G. powder, and is closed by means of the bottom plug.

Action.—On shock of discharge the detonator pellet sets back thereby straightening the clips of the stirrup spring and being driven on to the needle of the needle plug, ignites the detonator, which fires the composition of the time ring, this burning till it reaches the magazine channel, thereby igniting the powder in the magazine.

Approximate weight .. .. 5¾ ozs.

Mark I fuzes differ from *Mark II* as follows :—

(1) The underside of the time ring is flat (instead of being provided with a lip and recess).
(2) The magazine channel is place at a different angle.
(3) The aperture in the bottom plug is smaller.
(4) The external contour of the fuze is slightly different.

Adapter, 2-inch Fuze Hole, Mark I.

This adapter is screwed into the shell when Fuzes T. and P. Nos. 54 or 62 are used. It is made of aluminium and is screwed externally below the shoulder to suit the 2-inch fuze hole and is screwed internally to the G.S. gauge. A slot is cut in the shoulder to take the "key, adapter" for fixing or removing and a steel set screw for fixing the fuze is inserted in a hole bored and screwed in the shoulder.

Key, Adapter, 2-inch Fuze Hole, Mark I.

This key, which is made of steel, is annular in shape at one end and has a projection to fit the slot in the shoulder of the adapter when screwing it into the fuze hole of the shell.

Key, Fixing and Setting, Fuze, Time, No. 25.

The key is made of steel. One end is annular in shape and provided with a projection to fit the slot in the fuze body, when fixing the fuze in the shell. The other end of the key is shaped to fit the hole in the time ring of the fuze, to facilitate setting.

Fuzes, Drill { Percussion D.A. with Cap, No. 1. / Time and Percussion, Middle, No. 54. / Time and Percussion, No. 62.

The drill fuzes resemble, generally, the service fuzes which they represent, and in some cases burnt-out service time and percussion fuzes are used for this purpose.

To facilitate identification, the drill fuzes are stamped "DRILL" and bronzed.

Adapter, Drill, 2-inch Fuze Hole, Mark I.

The drill adapter is similar to the service one, but is made of brass or other hard metal, blackened externally and stamped "DRILL."

TUBES.

Tubes, Friction, T, Marks I to IV*.

(*Plate XX.*)

Mark IV.—The form and general dimensions of the tube are shown on Plate XX. It consists of the following principal parts:—Body, head, copper ball, plug and friction wire.

The head is of gunmetal, the body of solid drawn brass, the ball of soft copper, and the friction bar of half around copper wire, twisted into a round bar, with a loop at one end and the other roughened. A hole in the side of the head of the tube over the friction wire is charged with about 2 grains of detonating composition, in the form of a paste, laid over the roughened part of the friction wire, the hole being closed with a screwed brass plug. The body is charged with 8 grains of pistol powder, and is closed with a cork plug, covered with shellac cement, and a paper disc. The end of the body is burred to secure the cork plug.

A brass pin is inserted to prevent the body becoming unscrewed. The upper part of the body has a central perforation, which is enlarged in its lower part into a conical recess. The copper ball is placed in this recess, and is retained therein by a screwed plug, pierced by three fireholes.

On the withdrawal of the friction bar the detonating composition is ignited, and the flash, passing down the perforation in the head and through the plug, fires the powder charge. The ball is driven upwards by the explosion and seals the tube. This, together with the mode in which the tube is held in the special vent employed with it, prevents the escape of gas.

The body is lacquered inside and outside.

*Mark IV** is a fired Mark IV tube fitted with a new shank (or body), and filled, and having the head re-fitted with a new friction wire. The earlier Marks of T-tubes differ only in minor details from Mark IV.

Marks I, I*, II and II* will be used up with blank ammunition.

Total length of tubes .. .. .. 1·9 inches.

The tubes are issued in square tin boxes, 10 in a box. Both the top and the bottom of the box are removable, being secured by soldered bands, and the tubes are so arranged that five may be withdrawn from the top and five from the bottom.

†Tube, Friction, T, for Blank, Mark I.

Adapter.

Tube, Copper.

(*Plate XXI.*)

The tube is made of solid drawn copper, 1·89 inches long, with a solid head. It is filled with pistol powder, and the bottom is closed by a paper disc, over which is a cork plug secured by shellac.

† Not to be used until T tubes, Marks I, I*, II and II* are used up.

The nib piece is solid drawn and projects right through the tube; it is secured by solder, and has a small hole bored in it to allow the flash from the detonating composition to reach the powder in the tube.

The nib piece contains a copper friction bar, roughened, and smeared with detonating composition; the composition is damped with shellac varnish while it is being smeared on. The nib piece is flattened so as to retain the friction bar, the projecting portion of which is formed into a vertical eye, into which the hook of the lanyard fits.

The adapter consists of the head of a used T friction tube, formed to receive the above-mentioned tube, and fitted with a removable stem.

For firing, a tube is inserted into the adapter and the lanyard hooked into the eye. On pulling the lanyard the friction bar is drawn out, igniting the composition and firing the tube.

The adapter can be used for several rounds, tubes being inserted, as refills, as required.

Notes.

In the event of a tube failing to ignite a charge, care should be taken in extracting the fired tube not to stand directly in rear of the howitzer, as the gas generated will cause the tube to fly out with some violence so soon as the T head is clear of the recess in the vent.

The vent channel sometimes becomes choked with residue from the cartridge. When this occurs, the taper portion should be cleared with a "rimer, vent, T," sufficiently to allow of the insertion of a tube, which, when fired, will remove the rest of the obstruction.

A tube is not to be inserted in the vent till the breech is properly closed.

Tube, Friction, T Drill, Mark I.

The drill tube is made of hardened steel, of the same external shape as the service tube. The head of the tube is grooved to receive a hardened steel spring, which is arranged for a pull of about 50 lbs.

Tube, Friction, T, Drill, Converted, Marks I and II.

These are fired service T tubes fitted with a steel spring clip, which is adjusted for a pull equal to that required for the service tube.

These tubes will supersede the "Tube, friction, T, drill, Mark I," when existing stock is used up.

DRILL FOR 6-INCH B.L. HOWITZER.

(In all words of command the word "gun" will be used instead of "howitzer," for the sake of brevity.)

THE DETACHMENT.

The detachment consist of 10 members, who will fall in two deep, **1** on the left of the front rank.

To Tell Off.

Section Commander.	*No.* **1.**
"....Section—Tell off."	

On the order "Tell off" from the section commander—**1** numbers **1**, the right-hand man of the rear rank **2**, his front rank man **3**, and so on in succession to the left.

Detachment Rear.

Formed as above—when unlimbered, to the rear of the trail or platform, facing the front; when limbered up, one yard in rear of the muzzle—**1** covering the left (or near) wheel.

To Move the Gun with Drag Ropes.

Section Commander.	*No.* **1.**
"....Section—With drag ropes, prepare to advance."	

At this order from the section commander, **6** and **7** hand the drag ropes to **2** and **3**; **2** and **3** hook them to the drag washers on their own sides; odd numbers on the off side, even numbers on the near side. All available numbers man them on their own sides, the two highest numbers to the shafts.

To Shift the Gun from the Travelling to the Firing Position.

Section Commander.	*No.* **1.**
"Shift from travelling to Firing Position."	"No.....Prepare to shift the Gun." "Prepare to bear down." "Bear down." "Heave."

On the order "Prepare to shift the gun," **2** and **3** thread the rope round the breech, if not already in position, and lead the ends to the rear; **8** puts on the brake.

At "Prepare to bear down," **4** places a handspike in the bore point first; **6,** one under it as a wedge; **7,** one across to **8**; **9,** one across to **10**; **5** goes to the elevating wheel; **2** and **3** man the ropes; **1** mounts on the trail and stands ready with a handspike.

On the order "Bear down," the Nos. on the handspikes bear down; **5** depresses, **1** pushes his handspike under the breech to prevent the gun from coming to the rear. As soon as the gun is borne down sufficiently to clear the housing bracket, **2** and **3** heave on the ropes and assist the gun to the rear; **1** and **5** replace the nuts on the ends of the piston rods; **2** and **3** remove their rope.

In replacing the nuts on the ends of the piston rods, when the gun is in the firing position, the following points must be attended to:—

(1) The nuts on the piston rods in front of the lugs on the gun must be screwed up to the front end of the thread.

(2) Screw on the rear nuts until the threads begin to show beyond the nuts. Care must be taken that the taper-hole through the nut coincides with the taper-hole through the piston rod before the keep pin is inserted. The direction of the taper is marked on the face of these parts.

The drill as laid down is for one detachment. It is possible for one detachment to do this shift, but it entails very heavy work, so whenever possible extra men should be put on. If two detachments are available, the second detachment should be used as follows:— **7, 8, 9,** and **10** double-man the handspikes, the remaining numbers double-man the ropes.

To Unlimber.

Section Commander.	*No.* **1.**
"....Section—Unlimber."	"No.....Prepare to Unlimber." "Lift." "Limber drive on." "Lower."

At the order from **1,** *"Prepare to unlimber,"* **2, 3, 4, 5, 6,** and **7** stand to the trail, **2** and **3** nearest the breech; **8, 9,** and **10** go to the shafts, **7** unkeys. **1** then gives "Lift," "Limber drive on." The limber moves clear, **6** and **7** pushing in rear, **2** and **3** lower the anchoring buffer, if attached. The detachment then take post.

To Limber Up.

Is the reverse of the above.

Positions in Action.

1—One yard in rear of the trail, facing the front.
2—Close to and facing the breech on the right side.
3—Close to and facing the breech on the left side.
4—In line with the trail eye covering the right gun wheel.
5—In line with the trail eye covering the left gun wheel.
6—With the metal-lined cartridge case.
7 and **9**—With the shells.
8—At the cartridge magazine.
10—At the shell magazine.

To Prepare for Action.*

Section Commander.	*No.* **1.**
" . . . . Section—Prepare for Action."	" Prepare for Action."

"*Prepare for Action.*"—The numbers provide themselves with stores as follows:—

1—6-foot handspike clinometer, piece of chalk, 50-foot tape, spanner, hydraulic buffer No. 82, and spanner No. 265.

2—6-foot handspike, a maul, rammer, wrench breech mechanism, vent bit, rimer, tube pocket and lanyard (for drill, a drill tube), check ropes (if required).

3—6-foot handspike, two aiming posts, a 5-foot picket, oil can, Russian tallow, waste; removes the breech and muzzle covers,† shifting rope, if not already on the gun, and assists No. **2** with check ropes.

4—6-foot handspike, sights and metal arc, or dial sight.

5—6-foot handspike, handle of pump, McMahon spanner, and lever jamming handwheel (for drill, a shell extractor).

6—Two drill cartridges.

7—Two fuze keys (for drill, a drill shell).

8—Metal-lined case with key. In battery only one per section is brought up by the Nos. **8** of Nos. 1 and 3 guns.‡

9—Loading tray and brush.

10—Hammer and file for removing burrs, 2 heavy drag ropes.

The handspikes are laid down, two on each side of the howitzer, close to the carriage, points to the front, bevelled side uppermost; those of **2** and **3** outside, and about 2 feet in advance of those of **4** and **5**; **1**'s handspike in rear of the platform.

2 and **3** lay down their stores, aiming posts on the ground, clear of the platform, on the right of the gun and parallel to it, the picket and maul outside the aiming posts, heads to the front, the maul outside, the rammer head to the front, inside the aiming posts.

2 straps the tube pocket round his waist, coils up the lanyard, passes the bight under the tube pocket strap, and receives the tubes from **7.**

3 places the oil can, Russian tallow, and waste in a convenient position for use.

4 places the sights in the gun, and clamps them at zero of the deflection scale, and the sliding leaves at the centre graduation; or, if dial sights are used, clamps all readings at zero and focusses the telescope, reversing it in its bracket if an auxiliary mark to the rear is likely to be used.

5 places the handle of the pump in the bracket on the carriage, places the lever jamming handwheel on the left of the gun after having tightened up the jamming handwheel as far as possible, and the McMahon spanner in the left bracket of the trail.

6 places the drill cartridges in the metal-lined case brought up by **8.**

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* Before leaving the gun park, No. **1** will test the clinometer for index error and will himself see that the buffers are filled with oil and the cut-off valves screwed home, and that the gun and mounting are ready in every respect for practice, the cut-off valves are always to be tested with the spanner provided.

† No. **3** of No. 2 gun will bring up two aiming posts in addtion.

‡ The Nos. **8** of Nos. 2 and 4 gun issue cartridges from the magazine, assist to load them on trollies, and take back the trollies.

7 obtains tubes and fuzes from **10,** and gives the tubes to **2**; he loosens the fuze hole plugs of the first two shells to be issued. At drill he places the drill shell in the loading tray.

8 places his metal-lined case in a position, under cover if possible, convenient for the two guns (otherwise about 10 yards in rear of them).

9 examines the shells and cleans them if necessary.

10 prepares to issue shells, tubes, and fuzes.

The stores having been arranged, **1** receives reports from the numbers responsible of any irregularity or deficiency in connection with the gun, ammunition, or stores. He will see that the bore is clear.

5 will bring the gun into a horizontal position. **2** and **3** open the breech; **2** examines the breech screw and vent and sees that they are clean, and rimes out the vent, and sees that the threads of the breech screw are free from burrs, rubbing the asbestos pad with Russian tallow; **3** examines the bore, chamber, and threads of the breech, lubricating the threads with a slight film of oil, if necessary.

To Open the Breech.

2 and **3** will open the breech as follows:—**3** releases the spring catch of cam lever with his right hand, and raises the lever to its full extent, then with both hands gives it a sharp pull towards him till hard against the stop, folds the lever down sufficiently far to release the breech screw, and then raises it again; **2** then takes hold of the handle of the breech screw with his right hand and of the cam lever with his left, withdraws the breech screw, and swings it sharply round in its carrier ring with the cam lever up.

To Close the Breech.

2 takes hold of the cam lever with his right hand and swings the breech screw round; **3** takes the cam lever from **2**; **2** shifts both hands on to the handle of the breech screw* and pushes it home; **3,** assisted by **2** if necessary, locks it, forcing the cam lever from him (if loaded, **2** inserts a tube); **3** lowers the cam lever, securing it by the catch in the handle of the breech screw.

To Load.

Section Commander.	*No.* **1.**
——	——
	" ....load."

1 gives **7** the nature of shell and fuze required. He places himself in a convenient position where he can superintend the loading.

10 issues a shell to **7** and **9.**

8 issues a cartridge to **6.**

7 and **9** bring up a shell in bearer, having fixed and set the fuze according to **1**'s direction. If time fuzes are being used, **1** will see that the fuze is correctly set. **7** and **9** place the shell in the bore after **3** has uncapped the fuze or removed the safety pins.

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* **2** must be careful to keep his hands clear of the stop on the carrier ring as the breech screw is turned round.

2 supplies himself with the rammer and holds it in a horizontal position, right hand back up near the rammer head, left hand back down near the centre; he inserts the rammer head in the bore, and reaches out to the end of the rammer.

3 pushes the shell by hand into the bore and takes hold of the rammer in a similar manner to **2**. On the word "Home" from **1, 2** and **3** ram home in one motion, putting all their weight on the rammer; **2** withdraws the rammer and replaces it.

9 removes the empty bearer.

6 brings up a cartridge and hands it to **3**.

3 takes the cartridge with his right hand and places it in the bore with the base of the core to the rear.

2 and **3** close the breech.

2 puts the tube in the vent* after the breech is closed.

1 will satisfy himself that the breech is properly closed, and report—"loaded and ready for action"—to the section commander.

The line of fire is now laid out:—

To Lay Out the Line of Fire.

The line of fire will be obtained by one of the methods described in Garrison Artillery Training, Vol. II (Siege). When an aiming post has to be held up at the sight, this will be done by **4**, while **6** will take out aiming posts to the front or rear when required.

To Lay the Gun in the Line of Fire.

Section Commander.	*No.* **1.**
"Layers."	"Take post to lay."

The arc, or dial sight, being on the gun, **4** holds up an aiming post as directed in G.A.T. Vol. II (Siege); **2** and **3** pick up their handspikes and go to the end of the trail, facing the front, ready to traverse; **5** goes to the elevating wheel.

As soon as the line of fire angle has been received, **1** repeats it, and **4** lays down the aiming post.

If arcs are being used, **4** sets the reader to the angle ordered; if dial sights, **1** puts the angle on the sight by clamping the base plate at the number of degrees and then putting the minutes on the small slow-motion drum.

4 then lays on the director, and gives "Take post" when **2** and **3** lay down their handspikes and take post.

An auxiliary mark is then picked up If arcs are being used the procedure is as described in G.A.T. Vol. II (Siege); **2** attending to the sliding leaf of the tangent sight and **4** to that of the foresight or the reader of the arc.

If dial sights are being used, **1** unclamps the base plate of the sight, and sets the small slow-motion drum to zero; **4** lays the telescope on the selected auxiliary mark; **1** clamps the base plate at the nearest degree below the actual reading; and **4** gets the pointer of the telescope accurately on the auxiliary mark by turning the small slow-motion drum; **4** then gives "Take post."

---

* The tube is never to be inserted before the breech is closed under any pretext whatever.

If necessary, **1** gives the order "Plant picket," and **2** with the maul and **3** with the picket double out and plant it in line with the auxiliary mark, under the direction of **4**; **5** attending to the tangent sight, if necessary. They then take post.

1 notes all readings, marks them on the gun or marking board, and takes post.

If the gun is not on a platform, check ropes will if necessary be adjusted to the trail and wheels as soon as the auxiliary mark is picked up. **3** and **5** will make fast to the felloe of the left wheel, **1** will superintend and attend to the trail, **2** and **4** will make fast to the felloe of the right wheel. In making fast check ropes care should be taken that they are evenly attached to both wheels, as otherwise the gun will recoil out of line. It may be necessary to raise one axletree arm with a jack to ensure this.

If the gun is on a platform the trail plank and wheel plates should be adjusted as soon as the gun is roughly layed on the director.

To adjust the trail plank, **2** and **3** place their handspikes under the trail eye and raise it; **1** and **5** shift the plank. To adjust wheel plates, **6** arranges a jack under the axletree and lifts while the numbers adjust the wheel plates on their own sides.

To Lay the Gun.

Section Commander.	*No.* **1**.
"No.... Gun." "Deflection.... left (or right)." "Elevation.... "	"Take post to lay."

When using Crossbar Sights.

The section commander first calls out the deflection; **4** repeats it and sets it on the sight; **1** chalks it on the gun. The section commander then calls out the elevation. **1** repeats it, and chalks it on the gun.*

4 lays the gun, with the deflection ordered, on the auxiliary mark. As soon as the gun has been roughly layed for line, **1** takes the difference of level of wheels with the clinometer, calculates the deflection necessary to correct it, and orders **4** ".... more R (or L.)." **4** alters the deflection accordingly, completes the laying, and removes the sights; **2** and **3** lay down their handspikes, and **2** prepares the lanyard; **5** brings the gun to the approximate elevation; **1** then places his clinometer, set at the required elevation, on the clinometer plane, and gives "Elevate" or "Depress"; **5** turns the wheel in the required direction till the word "Halt" (the last motion should be one of depression)—a good sweep of depression should be given so as to take up backlash; **1** gives the order "Clamp"; **3** clamps the elevating arc; **1** removes

* Section commanders will keep a record of the elevation and deflection of each round in their note-books (Army Book 102).

the clinometer and places it in the case. Each number "takes post" after completing this work.

When using Dial Sights.

The section commander first calls out the deflection; **1** repeats it, sets it on the deflection drum, and marks it on the gun or marking board; **4** commences to lay for line on the auxiliary mark, **5** bringing the gun to the approximate elevation.

The elevation is then called out; **1** repeats it, marks it on the gun or marking board, sets it on the elevation drum standing on the dial sight box to do so (the last motion in turning the drum should always be one tending to increase the angle) and lays for elevation.

4 and **1** lay simultaneously for line and elevation respectively, **4** keeping the bubble of the cross-level in the centre of its run—unless it is inconvenient for him to do so, in which case **1** does it.

As soon as **4** has completed laying, **1** completes his laying and gives "Clamp." **3** clamps the elevating arc, **1** removes the sights, and all numbers take post.

PUBLIC LIBRARY OF VICTORIA

To Make Ready and Fire.

Section Commander.	*No.* **1.**
"Fire No.... Gun."	"No.... Ready." "Fire."

1 gives "Ready," and all the numbers step clear; **2** hooks the lanyard to the tube with his left hand, steps clear of the recoil, facing the front, and holding the lanyard in his right hand stretches it taut, keeping his hand level with the vent, forearm across the body. When he sees that all the numbers are clear, **1** gives the order "Fire," when **2** slews his body to the right and fires the gun, coils up the lanyard, passes the bight under the tube pocket strap and **4** replaces the sight or sights; **3** unclamps; **5** steps in and brings the gun to a horizontal position; **2** and **3** open the breech; **2** removes the old tube and rimes out the vent; **3** cleans the threads of the breech with a piece of waste; **2** cleans the breech screw, and applies Russian tallow to the asbestos pad when necessary.

If the order to load has been given, the numbers proceed as previously detailed. If no order to load has been given, the numbers take post.

Missfires.

On a missfire **2** will drop the lanyard. After a pause of 10 seconds **3** raises the cam lever, **2** removes the tube and inserts a fresh one. Both numbers must keep as clear of the vent as possible. **3** lowers the cam lever; **2** hooks the lanyard and again pulls it.

Should missfires continue, the breech will be opened after a pause of three minutes from the last missfire.

To Run Up.

Section Commander.	*No.* **1.**
	"No..... Run up." "Halt."

2 and **3** take their handspikes at the centre with the hands next the muzzle, backs up; the other hands at the small end, backs down. They use their handspikes as levers under the rear part of the wheels, facing the rear; **4** and **5** man the wheels; **6, 7, 8,** and **9** double-man, if necessary. **1** applies his handspike under the trail eye. As soon as the gun is sufficiently run up **1** gives "Halt." The numbers remove their handspikes, lay them down, and the detachment take post.

If necessary, drag ropes will be brought up and hooked by **6** and **7,** and manned by the whole detachment. The command will then be "With drag ropes, run up."

To Cease Firing.

Section Commander.	*No.* **1.**
"Cease firing."	"Cease firing."

The stores are replaced by the numbers who brought them up. **5** depresses the howitzer until the cradle is on the stops. After replating stores the numbers fall in "Detachment rear."

To Limber Up.

This is the reverse of unlimbering.

To Shift the Gun from the Firing to the Travelling Position.

Limber up and depress the gun as far as it will go. Place the cover over the breech and secure it in position.

Section Commander.	*No.* **1.**
"Shift from Firing to Travelling Position."	"No..... Prepare to Shift the Gun."

3 threads a 2½-inch tarred rope from the rear, on the right side, between the cradle and the two ribs on the gun, round the breech to **2,** who passes it back to the rear on the left side between the ribs and the cradle; **2** and **3** then take a turn round the recoil buffers in front, and lead the ends out at right angles to the gun on either side; **4, 6,** and **8** man the ropes on the left side; **7, 9,** and **10** on the right. **1** puts on the brake, **1** and **5** remove the nuts off the piston rods, **5** elevates; the ropes are then eased off, **2** and **3** pushing at the muzzle if necessary. **1** on the left side watches the projections on the gun and gives the necessary orders to "Ease off" and "Elevate," until the projections on the gun rest in the housing bracket.

Remove the rope or leave it in position as desired.

Care must be taken that the folding bracket between the trail is in the correct position to receive the projections on the gun—that is, folded over towards the breast of the carriage.

The stores are then replaced on the carriage ready for travelling.

Blank Cartridges.

Cartridges of 5 lbs. L.G. will be issued for drill only. They are never to be fired at angles of elevation of less than 15°.

As no sponge is issued with this equipment, the chamber of the gun will be cleaned out with a damp water brush.

Star Shell.

When firing star shell, **7** fuzes the shell, **1** sets the fuze and removes the safety pins.

Duties of the No. 1.

1. He is responsible for the efficient service of his gun, and that the section commander's orders are carried out.

2. (Except with dial sights) when platforms are not employed, he will take the difference of levels of wheels every round as soon as the gun is fairly in its proper line, and will calculate and give to the layer the necessary deflection to correct for it.

(Except with dial sights) when platforms are employed, he will take the difference of level of wheels as soon as the gun is fairly in its proper line for the first round, and will calculate the necessary deflection to correct for it. This deflection he will give to the layer each round, immediately after the section commander's orders as to deflection have been given.

3. He lays for elevation, and should, from time to time, see that the tangent sight, deflection scale, and sliding leaf, are correctly set by the gun layer. With dial sights, he sets all readings except the small drum, and lays for elevation. He also attends to the cross level of the sight if it is inconvenient for the layer to do so.

4. He will watch the recoil of his gun, and whenever it fails to return to within 2 inches of the firing position he will order more oil to be pumped into the buffers. He will also watch all glands for leakage.

With howitzers fitted with cut-off valves to the buffer, he will try the valve with the spanner provided before firing commences to see that it is closed, and when it is necessary to pump in more oil he will see that the valves are opened before and closed after doing so.

5. He gives the orders to load and to fire his gun, and his gun is never to be fired without his order.

6. In the absence of the section commander the senior No. 1 of the section takes his place. If it is inconvenient for the section commander, owing to other duties, to pass down the orders received from the battery commander, he should do so for him ; and he should always be on the look out for this occurring.

Duties of the Gun Layer.

1. He is responsible for laying the gun for line, and, with dial sights, for cross-levelling the sight unless it is inconvenient for him to do so.

2. Before laying each round he will (except with dial sights) check the readings of the sliding leaves, to see that they have not shifted.

He will then (except with dial sights) set on the deflection scale the deflection ordered by the section commander, and afterwards add to it the deflection ordered by the No. 1 for difference of levels of wheels.

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Points Requiring Attention in Action.

The shell should be rammed sufficiently hard home to ensure its not slipping back when the gun is elevated.

The jamming screws of the radial arm should be so adjusted as to admit of the gun being easily traversed, without allowing too much play.

A careful watch should be kept on the glands to ascertain if there is leakage. If any leakage occurs, the glands must be screwed up, but not too much, as pressure will cause undue friction.

Any alteration in the position of the carriage, or of the gun in the cradle, should be noted. If at any time the gun has slipped back in the cradle more than 2 inches, it should be pumped up.

The clamping hand wheel of the quick-motion elevating gear, where such is fitted, should be clamped tight before action.

The clamp of the elevating arc should be kept free from oil, and should be clamped tightly after laying for elevation. The handle should be adjusted so as to facilitate this.

SHIFTS.

6-INCH B.L. HOWITZER.

To Shift from Travelling to Top Carriage by Gyn.

Strength of the detachment 13 numbers.

Stores Required.

Gyn, 18-feet, light, complete		1
Drag ropes, heavy, pairs		4
Hammers, claw		1
Skids, 3′ × 4″ × 5″		1
Lever, lengthening, No. 4		1
Spanners	McMahon	1
	No. 180 (for tension bolt and pivot plug)	1
	No. 181, socket	1
	,, 83, nut and gland anchoring	1
	,, 84, nut tube anchoring	1

Note.—Where the slot on the sheath of the axle is not sufficiently cut away to allow of the carriage being lowered on to the pivot plate without resting on the anchoring buffer, the anchoring buffer will have to be removed as follows :—Disconnect the cross head from the radial arm, first withdrawing piston rod as far as possible, unscrew and remove the cross head from front end of piston rod, unscrew and remove the nut on rear end of piston, the volute springs can then be removed. Unscrew the large nut in front of stay, the buffer can then be taken out from the rear.

Officer.	*No. 1.*
"*Shift the Gun.*"	"*Prepare to shift the Gun.*" "*Prepare to place the Gyn.*" "*Shift the Gun.*"

"*Prepare to shift the Gun.*"—Remove the sights, breech fittings, and brake gear, cast loose and lay down handspikes, &c.

Radial Arm.—The radial arm is removed by disconnecting the anchoring buffer and unscrewing the clamping and jamming screws.

Pivot Plug.—Screw in the pivot plug and see that all the nuts of the pivot plate are down flush.

The gyn* is brought up, put together, and raised as near the emplacement as possible, the howitzer traversed extreme right.

"*Prepare to place the Gyn.*"—The gyn is placed over the C.G. of the howitzer, the prypole resting on the right front corner of the platform, the left cheek close against the left side of emplacement.†

"*Shift the Gun.*"—The carriage is slung with two drag ropes, passed twice round the axletree inside the wheels, drag ropes on the double. Steadying ropes are applied in the usual manner‡ and the gyn worked until the wheels are clear of the ground, when they are removed. Lower the howitzer and carriage until the latter rests on the pivot plate; the drag ropes are then removed. The gyn should now be placed so that the head is about 6 inches in rear of the C.G. (otherwise some difficulty will be experienced in getting the howitzer into the trunnion holes of the top carriage).

The howitzer is slung by means of a drag rope on the double, passed under the muzzle, in front of the guides, and round a 4 × 5 placed in the breech, steadying ropes applied as before, remove capsquare, and work the gyn until the howitzer is sufficiently high to admit of the top carriage being fixed. The side pieces of the top carriage are placed in position, the transom placed in front, and the whole keyed up.

The howitzer is lowered into the trunnion holes, the capsquares, elevating gear, breech fittings, nut and springs of pivot plug adjusted.

To Shift from Top to Travelling Carriage.

This operation is the reverse of the above. The howitzer should be slightly muzzle heavy when lowering to travelling carriage.

To Shift from Travelling to Top Carriage without the Aid of a Gyn.

This operation may be carried out as follows :—

Strength of detachment, 19 numbers.

Stores Required.

Drag ropes	2
Handspikes, 6-feet	5

* When this shift is carried out in a regular constructed siege battery, Mark III gyn is the most suitable.

† The gyn may be placed in any position when the howitzer is in the open.

‡ The buffers should be full and a piece of wood placed beween the front of cradle and the sight bracket, to prevent the howitzer sliding through the cradle.

LIMBER.

Swingletree. Lifting jack, Clerk's. Lever, compressing springs.¶ Camp kettle. Drag washers, 1st class, *under*. Maul, *under*. Felling axe, under. No. 1. Connector, engine draught, *under*.

2 brake blocks. Pair heavy drag ropes. Camp kettle. Billhook, *under*. Loop washer, 2nd class, *under*.

Shovel, } Shovel, Swingletree. } *under*.

LIMBER BOX.

Grease box, 3 lb., Water bucket, } *under*. Sight, dial, No. 4 (in box).

Handsaw, in case. Key lock, in pocket. Lamp siege (or Lantern bull's-eye) in box.

Pickaxe, Water bucket, } *under*.

CARRIAGE.

1 can, lubricating, No. 9.
1 cover breech.

1 rope check.

1 pincers.
1 brush, breech screw.
1 handspike, 6 ft.

1 lever, jamming, hand wheel, elevating.

1 hammer, claw.
1 spanner, McMahon.

1 bit, vent
1 rimer vent, T } ‡

1 handspike, 6 ft.,
1 „ 6 ft.,
1 piasaba brush,
1 rammer,
1 handspike, 6 ft.,
1 „ 6 ft., } *under*.

1 lever, iron, pointed.

1 spanner, No. 182 (elevating gear).

6-in. 30 cwt. B.L. HOWITZER LIMBER BOX, LID.

1 rimer, vent, T.

¶ 1 rimer, vent, T (spare).

6-in. 30 cwt. B.L. HOWITZER LIMBER BOX.

§ 1 spanner, nut, tube, anchoring, No. 84.
¶ 1 spanner, nut and gland, anchoring, No. 83.
¶ 1 spanner, nut and gland, piston rod, No. 80.
§ 1 spanner, No. 193.
¶ 1 lever, lengthening spanners, No. 4.
¶ 1 spanner, gland, floating piston, No. 86.
Cordage, tarred, spun yarn, hemp, lb., 2.

Packing. ½ in. square:
- length of 66 ins. { cotton, plaited, lengths, 1*a*. hydraulic, lengths, 1*b*.
- length of 44 ins. { cotton, plaited, lengths, 2*a*. hydraulic, lengths, 2*b*.

1 Measure, hydraulic buffer.§
Socket extending worm spindle.
Twine, whipping, ¼ lb.
Hambro' line, 1; Marline, 1 lb.
Tallow, Russian, 1½ lb., in box.
§ 1 spanner, floating piston, No. 87.
Ties, linch pin, 10.
Dubbing, 1 lb. (in box).
§ 1 key, pump seating.
1 pair pliers, side cutting.
1 spanner, No. 265.

Sponge cloths, 10. Pocket tube, L.S., with strap.

¶ 1 vent, T, axi[al] tray.

Tubes, friction T, 50 in box. 1 linch pin, 1st class. 1 linch pin, 2nd class.

1 spanner, socket, No. 181.§

{ Pads, obturating, Discs, adjusting Discs, protecting

Oil can, No. 5.

1 wrench, breech mechanism.

Clinon[...] larg[e] in c[...]

a. When the buffer is charged with mineral oil.
b. „ „ „ fluid, lifts and jacks.

200
No.
371

6-in. 30 cwt. B.L. HOWITZER LIMBER BOX, LOWER TRAY.

1 bit vent.
§ 1 spanner, tension bolt and pivot plug, No. 180.
1 file, half round, and handle.
1 spanner, plug filling, No. 82.
3 lubricating screws.
¶ 1 spanner, gland, and capsquare screws, No. 81.

1 reel, carpenters'.
1 screwdriver.
1 plummet, laying.
1 line, carpenters.
2 lanyards, firing, field, T, Marks II or III.
§ 1 plug, tube protecting, piston tail rod.
1 key, adapter, 2 in. fuze hole.
1 driver, screw, narrow, 2⅛-ins.

1 knife, clasp.

1 plate, preserving, bracket, fore sight.
{ Springs— 1-catch cam lever. 1-latch carrier ring in leather pocket. } { 1 tape measure.
1 spring, clip carrier ring { 2 pins, keep, hinge bolt, cam lever { 1 drill tube. 2 clamps, tangent sight

2 plugs, filling.
2 washers, leather.
4 ozs. chalk, white.
1 key, powder

6-in. 30 cwt. B.L. H[OWITZER] LIMBER BOX, UP[PER TRAY].

1 fore [sight].

1 tangent sight.
1 tangent sight.

To Shift the Travelling Carriage.

This operation is the reverse of the above.

Note.—This method of shifting should always be adopted in open batteries when the employment of gyns would serve to expose the position of the battery. But in well concealed positions the method of shifting by gyn is quicker and easier, requires less stores, and a smaller detachment.

To Mount or Dismount the Howitzer on to or from its Travelling Carriage.

This operation would always be done with the aid of a gyn.

LIST OF STRAPS.

Straps, Securing.			Position of Straps.
Size in Inches.	Service for which required.	No.	
	CARRIAGE.		
13 × ¾	Lever jamming handwheel elevating	1	On left side
16 × ¾	Pump lever	2	On left tensile rod
10 × 1	Water brush	1	On centre transom
	Pincers	1	On right side
13 × 1	Handspike	1	On right side
	Pointed lever	1	On left side
18 × 1	Handspike	1	On right side
112 × 1½	Handspike, piasaba brush and rammer	2	Under carriage
	LIMBER.		
10 × 1	Handle, lifting jack	2	On platform board
	Billhooks	1	Under limber, off side
	Camp kettles, handles	2	Under limber
	Props	2	On shafts
13 × 1	Felling axe	1	Under footboard
	Water brush	1	Under limber, near side
	Props	2	On frame shafts
	Swingletrees	4	Two under each futchel
	Loop washer	1	Under platform board
18 × 1	Connector, engine draught*	3	Under limber
	Lever, compressing springs	2	On platform board
	Shovels	2	One under each side
	Drag, washer, 1st class	1	Under platform board
22 × 1	Outriggers and stays	4	On splinter bar
22 × 2 D L	Limber box	2	On ends of box
26 × 1	Pickaxe	1	Under limber
	Grease box, 3 lbs.	1	Under limber
	Shovels	2	One under each side
30 × 1	Pickaxe	1	Under limber
	Maul (head)	2	Under limber
44 × 1	Camp kettles lids	2	On camp kettles
48 × 1	Drag ropes	2	On footboard
54 × 1 D L	Wood brake blocks	1	On front of box, off side

* Only required for No. 1 connector.

ALTERATIONS.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Part. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.

(4470) Wt. 3540 1500 5/09 H & S P. 08/463

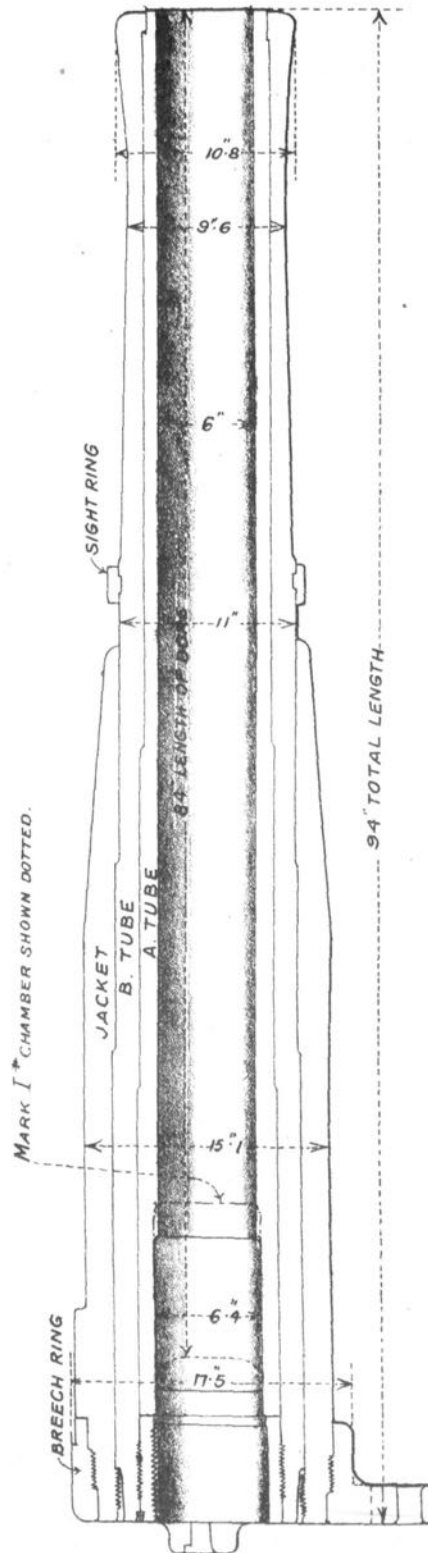



Plate I.

442. Wt 3540 - 583. 1500. 5/09.

Weller & Graham, Ltd Litho, London.

Plate II.
ORDNANCE, B. L. 6-INCH 30 CWT. HOWITZER.
GENERAL ARRANGEMENT OF BREECH MECHANISM.
SCALE = 1/5
ENTER ENGAGE LINK
A. BREECH SCREW
B. PAD, OBTURATING
C. AXIAL T VENT
D. CAM LEVER
E. CARRIER RING
F. COLLAR ACTUATING T TUBE
G. LINK ACTUATING COLLAR
H. CATCH, CAM LEVER.
J. CLIP, CARRIER RING.
K. LATCH, CARRIER RING
L. STOP BOLT.
Weller & Graham. Ltd, Litho, London.

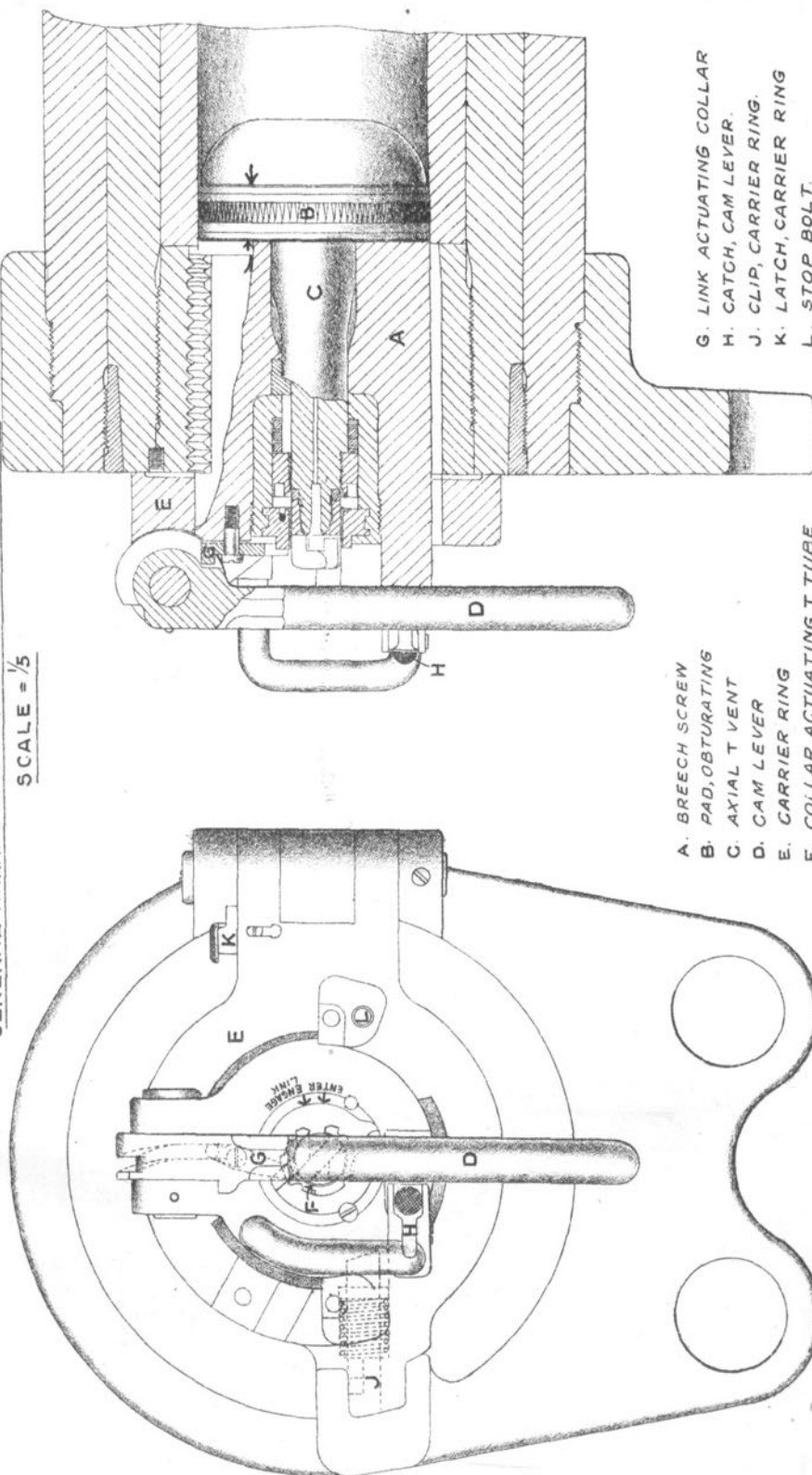
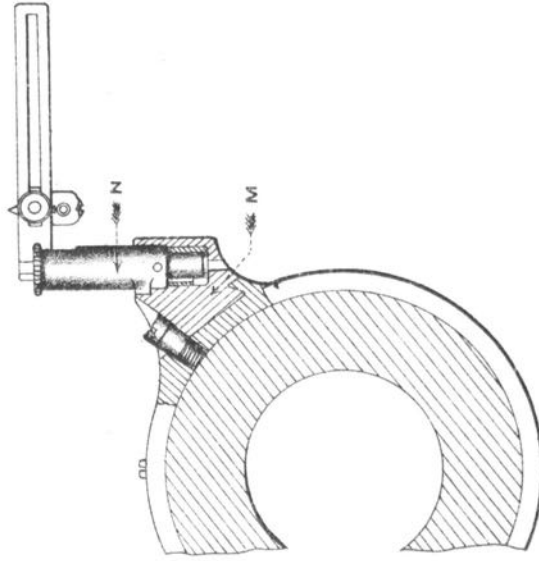
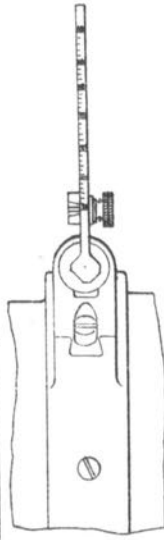
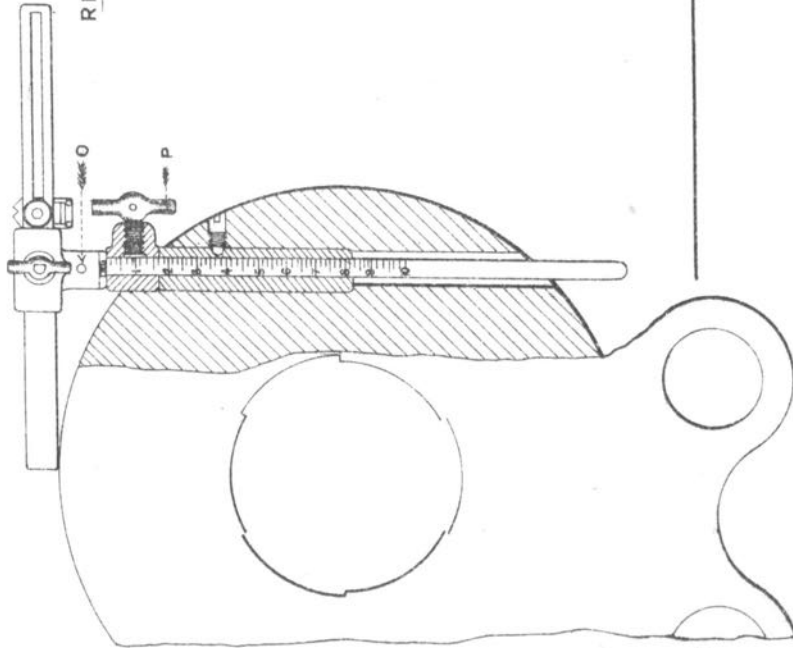



Plate III.
ORDNANCE, B. L. 6-INCH 30 CWT. HOWITZER,
SIGHTING.
SCALE = 1/6
FOR RIGHT SIDE
RIGHT HAND SIGHTS
O
P
N
M
M. BRACKET FORESIGHT.
N. SIGHT, FORE, CROSSBAR.
O. SIGHT, TANGENT, CROSSBAR.
P. CLAMP, TANGENT SIGHT.
2442

ORDNANCE, B. L. 6 IN. 30 CWT. HOWITZER.

STENCILLING.

— SCALE = 1/4 —

T. S

ELEV^{N}

DEFL^{N}

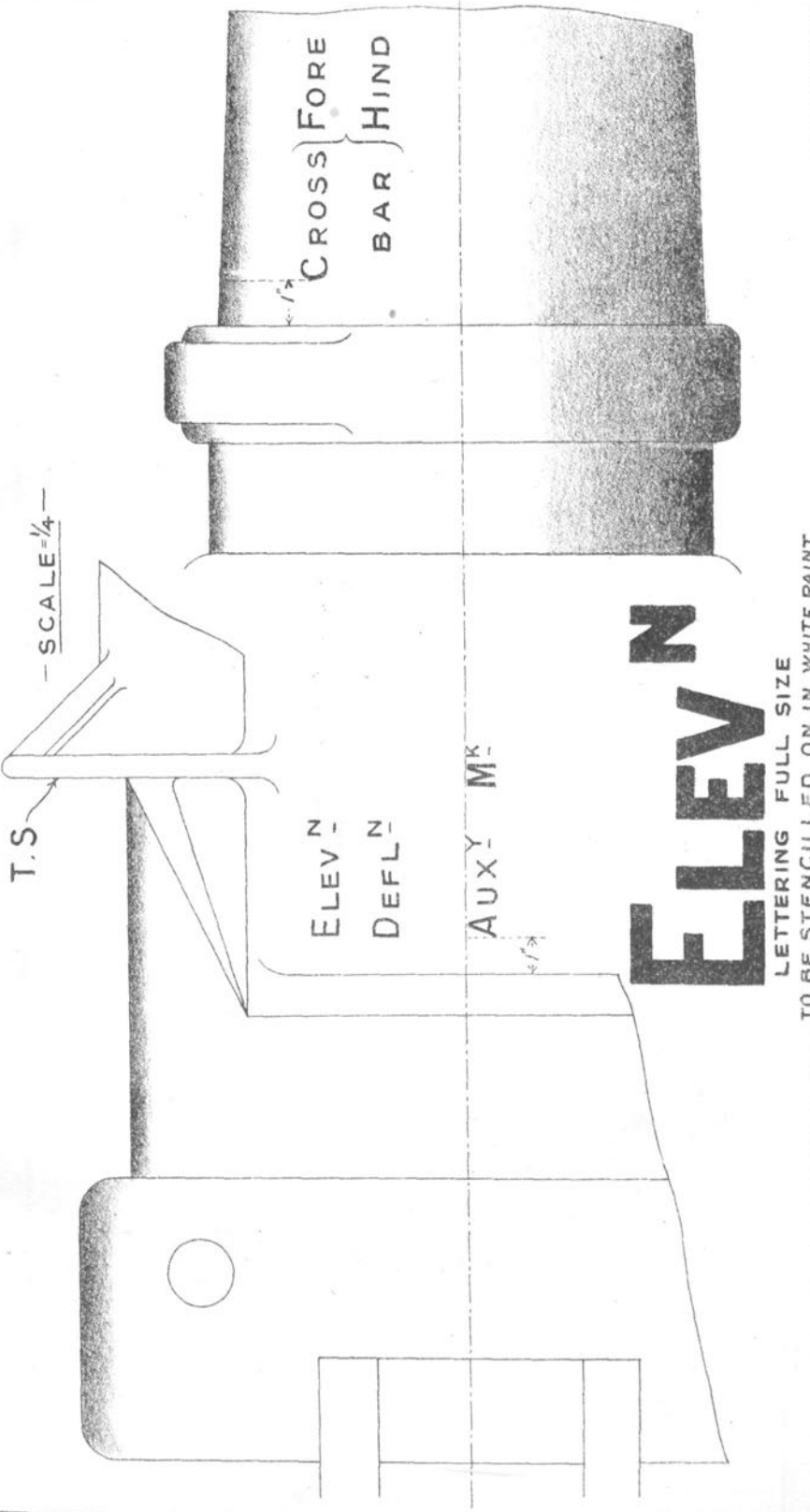
AUX^{Y} M^{K}

1"

CROSS } FORE

BAR } HIND

1"

ELEV^{N}

LETTERING FULL SIZE

TO BE STENCILLED ON IN WHITE PAINT.

2442

CARRIAGE, SIEGE, B. L. 6-INCH, 30 CWT. HOWITZER, MARK I*

SCALE = 1/16

35° ELEV.

0°

2442

Weller & Graham. Ltd. Litho. London.

CARRIAGE, SIEGE, TOP, B. L. 6-INCH, 30 CWT. HOWITZER, MARK I.

SCALE = 1/16

2442

Weller & Graham Ltd Litho London

CARRIAGE, SIEGE, B. L. 6-INCH 30 CWT. HOWITZER, MARK I.
BUFFER, HYDRAULIC.
SCALE = 1/8
BUFFER, ANCHORING
SCALE = 1/6
A
B
C
E
F
G
H
J
K
L
M
N
N'
O
P
R
S
T
U
Weller & Graham, Ltd Lith

LIMBER, SIEGE, B. L., 6 INCH, 30 CWT. HOWITZER, MARK I.

SCALE = 1/20

SIDE ELEVATION.

Weller & Graham, Ltd. Litho, London.

SIGHT, DIAL, No 4, MARK I.

2742

Weller & Graham Ltd Litho London.

SIGHT, DIAL, No. 4, MARK I.

Weller & Graham, Ltd. Litho London.

2442
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SHELL, B. L. COMMON, LYDDITE, 6-INCH, HOWITZER, LIGHT, MARK I.

SCALE = 1/3.

11·92" RAD.

22·66"

5·97"

2442

Weller & Graham, L^td. Litho London.

Plate XIII.

SCALE = 1/3.

SOCKET
STEEL HEAD
WOOD "
FELT WASHER
6 STEEL SCREWS
6 STEEL TWISTING PINS.
WOOD
BULLETS
BROWN PAPER
RESIN
STEEL DISC.
TIN CUP

19·622"

5·97"

Weller & Graham. Ltd. Litho, London

SHELL, B.L. STAR 6-INCH, HOWITZER, MARK I.

SCALE = 1/3

2442

Weller & Graham, Ltd. Litho. London.

FUZE, PERCUSSION, DIRECT ACTION, WITH, CAP, Nº I, MARK II.

SCALE = 1/1

FUZE PERCUSSION, DIRECT ACTION, WITH CAP Nº I. MARK III

SCALE = 1/1

Waller & Graham Ltd. Litho London.

FUZE, PERCUSSION, DIRECT ACTION, DELAY, Nº 10, MARK III.

METAL: I IN A TIN CYLINDER.

FULL SIZE

2442

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FUZE, PERCUSSION, DIRECT ACTION, IMPACT, Nº 13, MARK IV.

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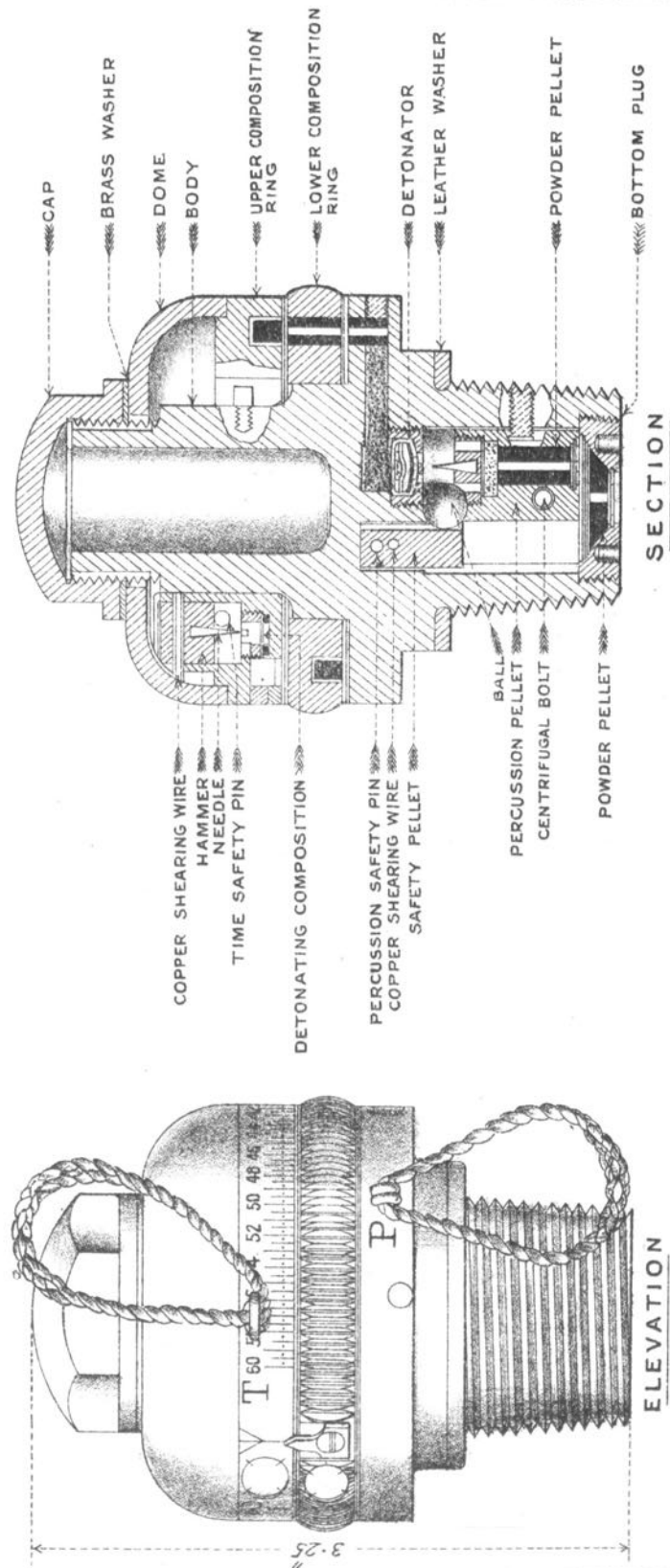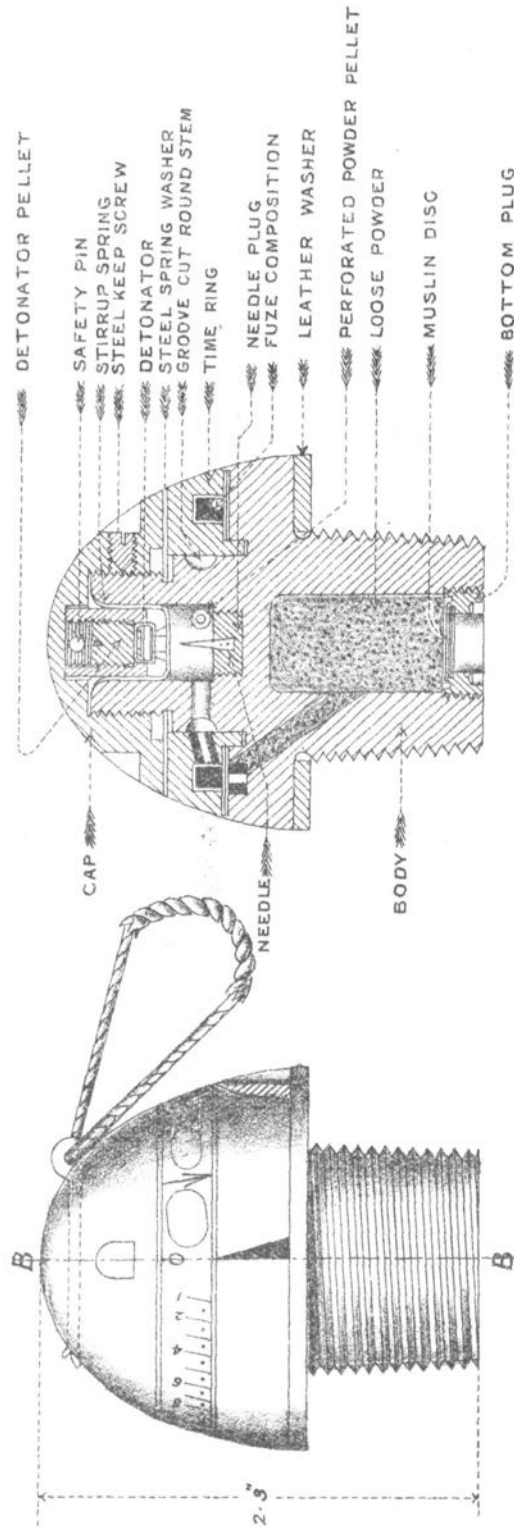
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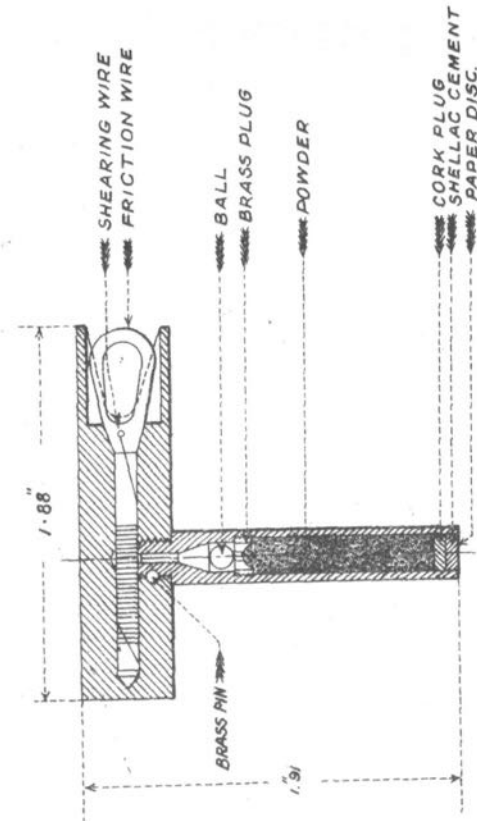
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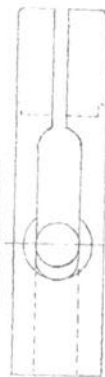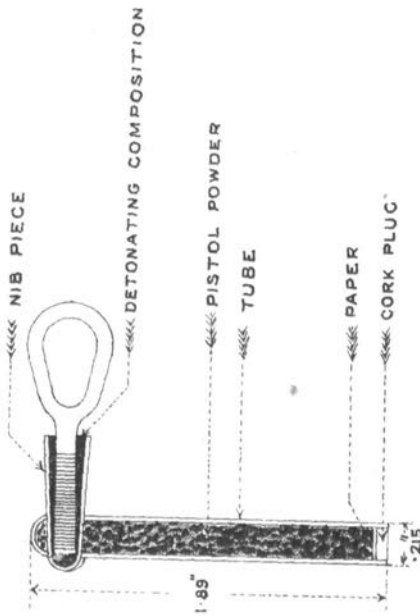
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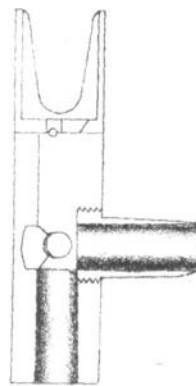
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MARKS I AND I*.

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PLATES.

NOTE.—This book is corrected up to December, 1914. Any alterations which may be suggested should be forwarded direct to Chief Inspector, Royal Arsenal, Woolwich.

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hi

ORDNANCE, B. L. 6 INCH 30 CWT HOWITZER, MARK I. & I*

SCALE = 1/12

Mark I* Chamber shown dotted

Breech Ring

Jacket

B. Tube

A. Tube

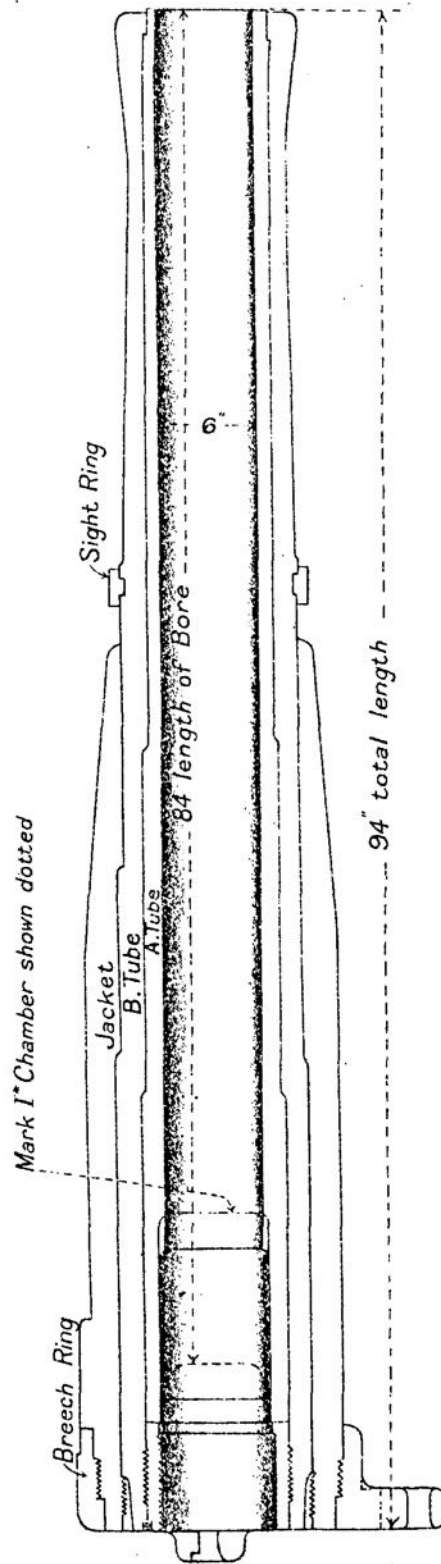
Sight Ring

84" length of Bore

6"

94" total length

3617. *7137/570. 3000. 3-15.

Malby & Sons, Lith.

B.L. 6-INCH 30-CWT. HOWITZER, MARKS I AND I*.

HOWITZER.

(*Plate I.*)

Material			Steel.
Length, total			94 inches.
Weight of	howitzer with fittings		28 cwt. 3 qrs. 5 lb.
	breech fittings		1 cwt. 2 qrs.
Bore	length		84 inches, or 14 calibres.
	calibre		6 inches.
Chamber	diameter		6·4 "
	length	Mark I howitzer	6·7 "
		" I* "	8·75 "
	capacity	Mark I howitzer	229 cubic inches.
		" I* "	295 " "
Rifling	system		Polygroove, hook section.
	length	Mark I howitzer	74·9 inches.
		" I* "	72·85 "
	twist		Uniform, 1 turn in 15 calibres.
	grooves	number	24.
		width	0·6 of an inch.
		depth	0·05 "
Obturation			Pad.
Firing mechanism			Friction T tube.
Venting			Axial.

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HOWITZER BODY, MARK I.

The howitzer is made of steel (without trunnions) and consists of A and B tubes, breech bush, jacket, breech ring and sight ring.

The B tube is shrunk over the A tube and secured longitudinally by means of corresponding shoulders and the breech bush which is screwed into the B tube at the rear. The breech bush is prepared for the reception of the breech screw, and is prevented from turning when in position by means of a steel stud which is screwed partly into the bush and B tube. Over the B tube is shrunk the jacket, secured longitudinally by corresponding shoulders and a screwed steel ring at the rear. The breech ring (which is furnished with lugs for the attachment of the howitzer to the hydraulic buffers of the carriage, and for the attachment of the breech fittings) is screwed over the jacket at the rear. A sight ring prepared for the reception of the foresight brackets is shrunk round the B tube in front of the jacket and secured by means of a set screw.

Longitudinal projections on the sides of the jacket act as guides for the howitzer when in the cradle.

A plane for clinometer is prepared on the rear portion of the jacket immediately in front of the breech ring.

The chamber is cylindrical, slightly coned at the entrance, and terminating in front with a curved slope.

Howitzer Body, Mark I*.

The howitzer body differs from the Mark I as follows:—
The chamber is enlarged and the length of rifling consequently reduced.

Breech Mechanism.

(*Plate II.*)

The mechanism is so arranged that by raising the cam lever and pressing it towards the left the breech screw is unlocked; by depressing the lever the obturating pad and discs are withdrawn from the seating in the howitzer, the breech screw can then be withdrawn through the carrier ring, and the mechanism swung into the loading position. After loading, the cam lever is raised, the mechanism is swung against the breech of the howitzer and the breech screw inserted, the screw is then turned to the locked position and the cam lever lowered.

Breech Closing Mechanism.

The breech is closed by a screw having three portions of the screw thread removed longitudinally, each one-sixth of the circumference. The interior of the howitzer at the breech being prepared in a similar manner admits of the screw, when the raised portions are placed opposite the smooth surfaces in the howitzer, being pushed home, and locked by the sixth of a turn.

The breech screw has hinged to it a cam lever by means of which it is locked and unlocked; the cam portion of the lever (when the breech screw is locked) engages in a recess in the carrier ring and so prevents any movement of the breech screw during firing. In lowering the cam lever after the breech screw is unlocked, the cam acting upon the surface of the carrier ring starts the first movement to the rear of the breech screw and obturator.

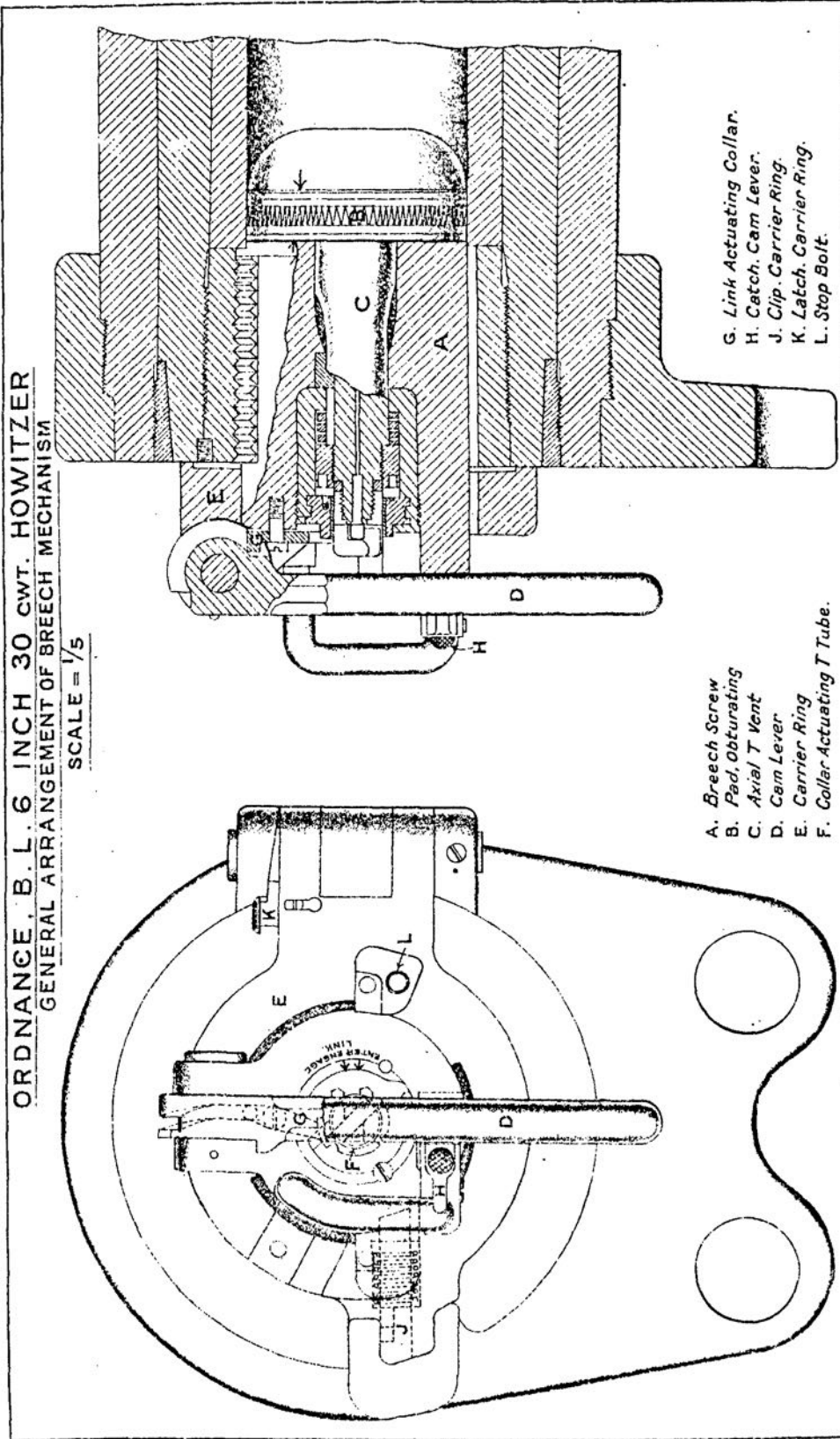
A "catch" is provided on the handle of the breech screw for retaining the cam lever in the down position.

Encircling the rear end of the breech screw, and hinged to the breech ring, is a carrier ring which supports the screw when withdrawn.

The carrier ring is held to the howitzer during the withdrawal of the breech screw by means of a clip fitted to the left side of the ring engaging with a recess in a projection on the rear face of the breech ring.

A stop bolt in the right side of the carrier ring serves to prevent the breech screw being disengaged from the carrier ring when withdrawn; at the same time the clip in the left side of the carrier ring is disengaged from the recess in the projection on the breech ring by means of a spiral spring which forces the opposite end of the clip into a recess in the breech screw, thus securing the latter in the carrier ring. When in this position the whole can be swung clear of the breech opening to admit of loading.

The carrier ring is retained in the loading position by a "latch."

ORDNANCE, B. L. 6 INCH 30 CWT. HOWITZER

GENERAL ARRANGEMENT OF BREECH MECHANISM

SCALE = 1/5

A. *Breech Screw*
B. *Pad, Obturating*
C. *Axial T Vent*
D. *Cam Lever*
E. *Carrier Ring*
F. *Collar Actuating T Tube.*
G. *Link Actuating Collar.*
H. *Catch. Cam Lever.*
J. *Clip. Carrier Ring.*
K. *Latch. Carrier Ring.*
L. *Stop Bolt.*

Malby & Sons. Lith

If, when opening the breech, the carrier ring remains fast owing to the "Clip, retaining" not working properly, the latter can be pushed back by inserting one of the screwdriver ends of the breech mechanism wrench in the hole provided for the purpose on the left side of the breech.

FIRING MECHANISM.

The firing mechanism is designed for friction firing with T tubes.

It consists of a steel axial vent passing through the centre of the breech screw, having secured to its outer end a head for the reception of the T tube. The vent is retained in the breech screw by means of a spring and nut. Fitted to the outer face of the breech screw, and encircling the vent head, is an actuating collar worked by the cam lever and link, by means of which the T tube is automatically turned into the firing position when the cam lever is lowered.

The T tube is automatically released from the vent and turned into the position for withdrawing when the cam lever is raised, the tube being withdrawn by hand.

OBTURATION.

Obturation is obtained by means of a mushroom-headed axial T vent of steel passing through the centre of the breech screw, with a pad and a pair of metal discs. The inner face of the breech screw is flat, and between it and the head of the vent the pad and discs are arranged. The pad is made of asbestos worked up with mutton suet to a proper consistency and enclosed in a strong canvas cover; it is reduced to shape and pressed in a hydraulic machine.

The protecting discs are of tin, and are arranged to fit the front and rear of the pad, respectively. The outer circumferences of the front and rear discs are protected by a steel ring, and the rear disc is also bushed with a bronze ring.

The obturation is of the slow coned type.

The discs are stamped with the words "Front" and "Rear" respectively, and the pads have the words "Front" stencilled on the side which corresponds with the front disc, and "Rear" on that which corresponds with the rear disc, in order that they may be correctly assembled on the vent.

If correctly assembled the whole should fit together compactly.

Action.—When the breech screw is pushed into the howitzer the obturator enters the chamber with perfect ease; on turning the breech screw the pad is pressed home into the coned seat in the howitzer by the travel of the screw. The bore is thus perfectly closed by a species of buffer in contact all round the circumference, while the mushroom head of the axial T vent receives the force of the gas on discharge. On firing the howitzer the pressure acts on the mushroom head of the vent and compresses the pad against the breech screw, causing it to expand laterally. From symmetry of form and position this expansion must be radial to the axis and equal in every direction, and is sufficient to prevent the escape of gas. On the pressure being removed elasticity comes into play and the

obturator can be withdrawn from the coned seat by a straight pull, which can be given so soon as the screw is unlocked.

Full instructions regarding the fitting, testing, adjusting, and treatment of pad obturators are contained in "Regulations for Magazines and Care of War Matériel."

To Remove the Breech Fittings.

Before removing the fittings the breech should be opened, the breech screw being swung into the loading position.

Cam Lever.

Take out the keep pin of the hinge bolt, when the latter can be removed and the cam lever withdrawn.

Link, actuating, collar.

Unscrew the axis pin of the link and withdraw the link.

Collar, actuating.

Unscrew the check screw half a turn, then turn the collar until the indicating arrow on it corresponds with the arrow and the word "Enter" engraved on the outer face of the breech screw, when the collar can be withdrawn.

Axial T *Vent and Obturator.*

Unscrew the nut of the axial T vent, and withdraw the latter with the obturating pad and discs from the front of the breech screw; the spring can then be withdrawn from the rear. To remove the obturator from the axial T vent the latter should be held by the head and the small end knocked gently on a block of wood, when the pad and discs will drop off the stem.

When the obturator is attached to the breech screw the removal of the latter from the carrier ring should be done by two persons, as care is necessary to keep the "Clip, retaining, carrier ring" withdrawn clear of the breech screw before drawing the latter back, to avoid damaging the obturating pad and discs. The obturator should, however, always be detached when possible from the breech screw before removing the latter from the carrier ring.

Breech Screw.

Withdraw the retaining clip from the breech screw and hold it back, move the breech screw forward in the carrier ring and push the stop bolt out from behind; the breech screw can then be withdrawn from the carrier ring, the retaining clip being held back until the former is clear of the ring.

Plate III.

Malby & Sons, Lith.

Carrier Ring.

Press down the retaining latch of the carrier ring, and place the latter in such a position as to admit of the set screw of the hinge bolt being unscrewed; the hinge bolt can then be removed and the carrier ring withdrawn from the breech. Care must be taken to replace the set screw in the howitzer when the carrier ring has been withdrawn.

Clip, carrier ring.

Remove the set screw, when the clip and spring can be withdrawn from the carrier ring.

Catch, cam lever.

Unscrew the axis pin of the lever of the catch; the lever and catch with spring can then be removed.

Latch, carrier ring.

Press down the latch until the stop screw is at the bottom of the slot, then unscrew the stop screw and remove it, when the latch and spiral spring can be withdrawn.

To Reassemble the Breech Fittings.

In reassembling the fittings on the howitzer the foregoing operations are reversed.

Care must be taken when placing the axial T vent and obturating pad and discs in the breech screw to see that the indicating arrows engraved on the head of the axial T vent, and the front end of the breech screw, correspond, as it is in that position only that the feather in the breech screw will engage with the featherway for its reception in the axial T vent.

In placing the actuating collar in position in the breech screw, the indicating arrow on the collar must correspond with the arrow, and the word "Enter" engraved on the outer face of the breech screw. When the collar is placed in the breech screw, it must then be turned until the indicating arrow corresponds with another arrow with the words "Engage link" on the breech screw before the link of the actuating collar is placed in position.

Stencilling on Howitzer.

(Plate III.)

Abbreviated headings of the necessary information required for laying the piece are stencilled on the cradle and chase of the howitzer, as shown on Plate III, which should be strictly adhered to in renewing the lettering.

Separate Demandable Stores.

Bit, Vent, 14-inch.

This is of round tempered steel furnished with a spiral bit at one end and hardened at the point; the opposite end is formed into a loop for convenience in handling. It is used for removing irregularities from the vent channel, and for cleaning it.

Box, Obturating Pads and Discs, B.L. 6-inch Howitzer.

The box is of wood, the sides being made of deal; ends and bottom of elm; top, battens and internal fittings of mahogany. The sides are dovetailed to the ends, and the bottom is secured by brass screws; it holds three pads and three sets of discs.

The box is fitted with a false lid; a gunmetal bolt passes through the bottom and both lids. Each lid is secured with a fly nut, both nuts being on the before-mentioned bolt. The false lid thus secures the pad and discs in the box (*see also* "Regulations for Magazines and Care of War Matériel") by having the fly nut screwed down upon it.

Round the top of the box, under the lid, sheet felt is secured with shellac and tacks to make a tight joint.

On the top of the lid there are two metal plates, each having a folding down handle for lifting purposes secured by screws; there is also a recess to contain a label of instructions.

The interior of the box is coated with paraffin wax, and the exterior is painted lead colour.

Rimer, Vent, T.

The rimer is of bronze, with steel shank and cross handle, and is used for clearing the tube chamber of the T axial vent.

Tray, Loading, B.L. 6-inch 30-cwt. Howitzer.

The tray is of steel, semicircular in shape, having a metal ring stop at the rear end, against which the base of the projectile rests when being carried in the tray. It is provided on the underside with a metal flanged stop, which engages with the breech face of the howitzer when the tray is in the loading position, and is prevented from turning by a projection on the front end which fits in the lower interruption in the breech opening. Two steel handles with leather hand grips are provided at the rear, and two steel levers having wood handles are pivoted to the tray, near the front end, in such a manner as to grip the projectile when the tray is used as a shell bearer. Two metal runners are attached to the interior of the tray so as to lessen the friction when pushing the projectile from the tray into the bore of the howitzer.

Wrench, Breech Mechanism, No. 50.

The wrench is of steel and consists of a socket spanner with cross-handle. The socket portion is for use with the nut of the axial T vent, and the actuating collar. The crosshandle is provided with screw-driver ends for use with screws and axis pins.

Side Arms, &c.

Brush, piasaba, B.L. 6-inch howitzer.—The brush has a head in three parts consisting of front part with brass liner, rear part with brass liner and pegs, and socket with copper band, two pegs, gunmetal keep plate, and bolt with two nuts. Any of the separate components of the head can be replaced as required. The wood stave is of ash and is secured to the head by a copper rivet. The rear end of the stave is provided with a metal joint for end stave. Total length 5 feet 6¼ inches.

Stave, end, No. 17.—For use with piasaba brush. Length without joint portion 4 feet 7½ inches.

Cover, breech, B.L. 6-inch howitzer.—The cover is made of water-proof canvas and has a leather lining sewn in at the bottom. It is shaped so as to fit over the breech of the howitzer to protect the breech mechanism, and is provided with a leather strap passed through a hem round its edge to secure it in position.

Cover, muzzle, No. 5.—The cover is made of khaki-coloured water-proof canvas shaped to suit the muzzle of the howitzer. A leather strap is provided on the cover for securing it in position.

Extractor, drill shell, No. 1.—The extractor consists of an ash stave grooved circumferentially at one end to enable a good grip to be taken when extracting the drill shell. The other end of the stave is furnished with a steel hook for engaging the crossbar of the shell. Total length 5 feet.

Rammer.—The rammer is of ash and consists of head and stave in one piece. A marking screw is fixed to the stave at 16·7 inches from the front end of the head. Length 5 feet 6 inches.

Lanyard, firing, No. 6.—The lanyard is made of tarred white line with steel toggle at one end. The toggle is flattened and slightly curved at one end so as to form an extractor for removing the T tube after firing. A steel hook is attached to the other end of the lanyard for hooking into the loop of the T tube. Length 4 feet 9 inches.

CARE AND PRESERVATION OF HOWITZER AND FITTINGS.

See also "Regulations for Magazines and Care of War Matériel."

To lubricate the hinge bolt of the carrier ring without removing the fittings, the small screw on the top of the hinge bolt should be removed and oil poured into the channel, taking care to replace the screw after oiling.

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CARRIAGES, LIMBER, PLATFORM, &c.

CARRIAGE, SIEGE, B.L. 6-INCH 30-CWT. HOWITZER, MARKS I AND I*.

(*Plate IV.*)

The carriage is constructed to allow of the howitzer being fired at angles varying from 35 degrees elevation to 10 degrees depression. The howitzer recoils axially in a cradle, which is fitted with hydraulic buffers to limit the recoil to about 18 inches, and with powerful springs to return it to the firing position. When the carriage, on its wheels, is secured on a double-decked platform, the recoil of the carriage is checked by an anchoring buffer; the anchoring buffer, which is held in a stay attached to the axletree and connected to the radial arm of the pivot plate, admits of the carriage recoiling about 5 inches. The carriage can, with the addition of the top carriage and the removal of the wheels, be used as a howitzer bed; when so used it is secured by a pivot plug to the pivot plate of the double-decked platform. A roller scotch is provided for travelling purposes.

The principal parts of the carriage are: Side brackets, forming the trail, cradle, hydraulic buffers and springs, elevating and brake gears, axletree and wheels.

SIDE BRACKETS.

The side brackets, which are of the double plate construction, are connected by top and bottom plates, transoms, and a trail eye bracket. Brackets of cast steel, in which are formed trunnion and axletree bearings, are riveted to the front. The front transom is a hollow casting of steel, with a projection formed on the rear part by which the carriage (when used as a howitzer bed, *i.e.*, without wheels and with the top carriage) is secured to the pivot plate, and a projection on the front part to which a brake bar is pivoted. A trail eye of cast steel is hinged to the trail eye bracket. A socket for a sighting step is fixed to the front end of each side bracket of Mark I* carriages in the Siege Artillery.

An arrangement for compressing the running out springs is fitted to the lower part of the trail.

CRADLE.

The cradle is in one casting of steel, with trunnions. It has an opening in the upper part, in which the howitzer slides on recoil, and two cylindrical openings in the lower part, each formed to take a hydraulic buffer.

The cradle is marked on the left side with a line of white paint, in such a position that when the line is opposite the bracket of the carriage the howitzer will be in the loading position.

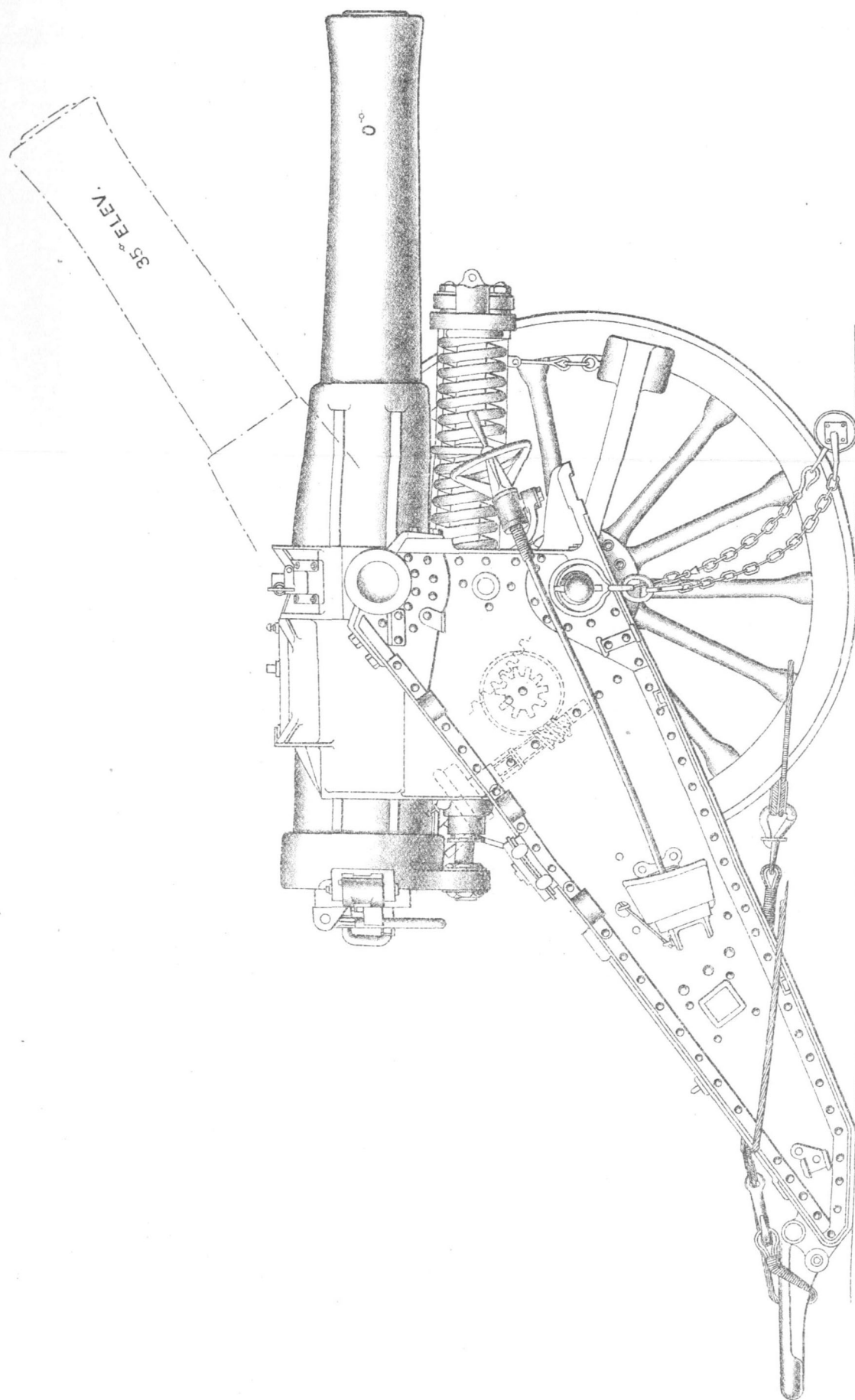
The cradles of howitzers in Siege and Territorial Artillery are fitted on each side with a bracket for supporting the No. 4 dial sight when in use. The bracket is provided with adjusting screws, adjusting bush and clamping handle. The adjusting screws are secured by locking nuts and act on opposite sides of a lug on the bush; this arrangement permits of an adjustment for alignment. The bush is suitably formed for the reception of the stem of the sight which is readily secured or released by the eccentric motion of the clamping handle.

CARRIAGE, SIEGE, B.L. 6-INCH, 30 CWT, HOWITZER, MARK I.*

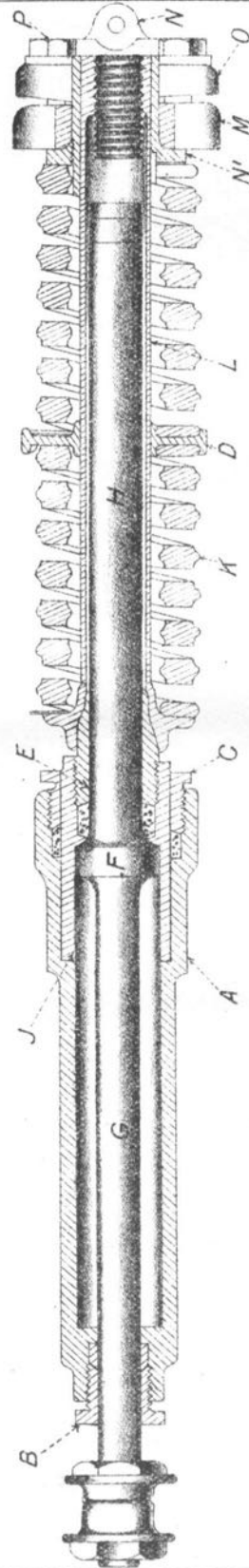
SCALE = 1/16.

35° ELEV.

0°

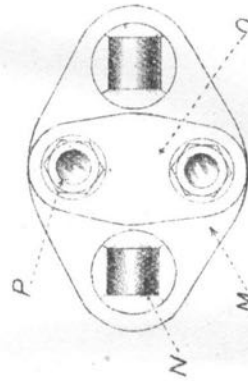
Malby&Sons.

CARRIAGE, SIEGE, B. L. 6 INCH 30 CWT HOWITZER,

BUFFER, HYDRAULIC, WITH RUNNING OUT SPRINGS.

SCALE = 1/8

A. Cylinder
B. Glands piston rod
C. " floating piston
D. Collars dividing springs
E. Gland piston tail rod
F.G.H. Piston with rod & tail rod
J. Piston floating

K. Springs running out.
L. Tube protecting piston tail rod.
M. Block connecting springs.
N. Plug, tube protecting piston tail rod.
O. Bar equalizing.
P. Bolts, tension spring.
N! Bushes block, connecting spring.

3577

Malby & Sons, Lith.

The cradles of howitzers in Movable Armament are fitted on each side with a bracket and socket for supporting the No. 1 dial sight when in use. The socket, which is interchangeable, fits into the bracket and carries the sight. It can be revolved to enable the sight to be used at any angle of elevation and is secured in position by a clamping handle attached to the bracket.

A split pin, which does not prevent the socket turning, is also fitted to secure it in the bracket when travelling.

Hydraulic Buffer and Running Out Springs.

(*Plate V.*)

Each hydraulic buffer consists of a steel cylinder, piston rod gland, floating piston gland, tail rod gland, piston with rod and tail rod, floating piston, and tube protecting piston tail rod with plug and bush. The cylinder, which is closed at the front and rear by glands, is enlarged at the front end to receive the floating piston, which is closed to the cylinder by the tail rod gland. A block at the front connects the ends of the tail rods and forms a bearing for the front end of the running out springs. The interior of the cylinder is slightly tapered so that the space around the periphery of the piston may form a varying orifice for the flow of the liquid; by this means an approximately constant pressure is maintained in the buffers throughout their stroke. A connecting pipe is fitted between the buffers to equalize the pressure. Filling holes are provided at the rear of the cradle for filling the buffers.

The travel of the piston averages about 17½ inches, and the floating piston about 3 inches.

Small flats are cut on the piston rod for use when bringing the howitzer from the travelling to the firing position.

A hand pump is fixed on the top of the left side of the cradle, for running up when the howitzer fails to return to the firing position. It is connected to the buffers by a steel pipe and elbow connection, and is fitted with a cut-off valve for closing the connections between the pump and the buffer. The valve must always be screwed home before firing by means of the spanner, No. 265.

The closed position of the valve is indicated by a line engraved on each square of the valve screw which comes flush with the top of the gland when the screw is home.

Contents of buffer, 6 quarts.

Running out springs.—The running out springs, two of which are placed on each of the "tubes protecting piston tail rod," are held in initial compression by means of a plug in the end of each tube, and thus retain the howitzer in the firing position.

Action.—On firing, the piston rods, which are connected to the breech ring of the howitzer, are drawn out of the cylinder at one end, and at the same time the tail rods are drawn in at the other; as the sectional area of the latter is greater than the former, the liquid which passes the pistons during recoil forces the floating pistons, and the glands attached to them, outwards, thus further compressing the springs; the energy thus stored up in the springs causes the howitzer to return to the firing position. The strain, due to the compression of the springs when the howitzer is fired, is taken by the block, bar, and tension bolts.

Elevating Gear.

The elevating gear is actuated by a handwheel, which transmits motion through worm-wheel gearing to an elevating arc attached to the left side of the cradle. A frictional arrangement is fitted in the hollow boss of the worm wheel, consisting of alternate plates of metal and steel respectively, arranged to revolve with the spindle of the worm wheel. The plates are pressed together by a nut, which is adjusted so as to produce sufficient friction to prevent the howitzer running down when at extreme recoil. Stops are fitted to the side brackets to limit the depression of the howitzer to 10°.

The elevating gear of carriages in the Siege Artillery differs from that described above in having a jamming handwheel instead of a nut on the end of the pinion spindle. A lever is provided for use in conjunction with the jamming handwheel, and a projection on its face engaging with one of the spokes or arms enables the friction plates to be compressed sufficiently to prevent undue slip on firing. Carriages fitted with this pattern of elevating gear are known as Mark I*.

A clamping arrangement is fitted on the left side of the carriage, and consists of a clamp, with nut, friction plates of bronze and steel, and lever. The clamp passes through the side bracket, and is actuated by the lever which moves the nut, clamps the elevating arc of the carriage against the inner face of the bracket, and secures the cradle in any required position.

Brake Gear.

The brake gear consists of two brake arms (each fitted with a wood brake block), two tensile rods, a brake bar, and a handwheel. The brake blocks are applied by means of the handwheel, on the right tensile rod, which is cut with a square thread on its front end to engage with a nut formed in the boss of the handwheel.

A bracket for carrying the equalizing brake bar is formed on the front transom, so placed that it will clear the lower tension bolt of the running out springs when the howitzer is at 10° depression, as well as the buffer springs when the anchoring buffer is housed for travelling, or when the carriage is fixed to the wheel plate and used as a bed. The brake bar is bent in the centre to suit the bracket. When the howitzer is being fired *not* from a platform, the travelling brakes may, if considered desirable, be applied for the purpose of checking excessive recoil.

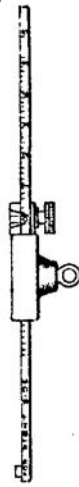
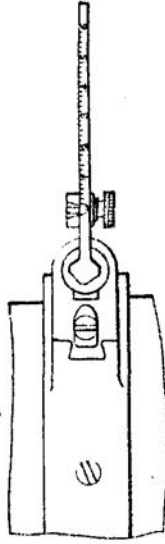
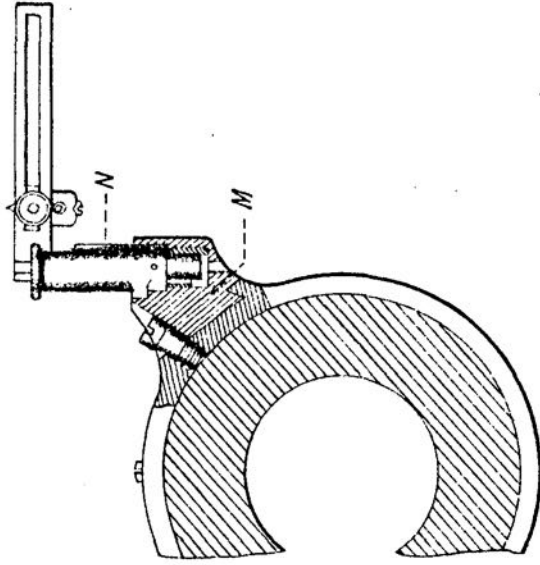
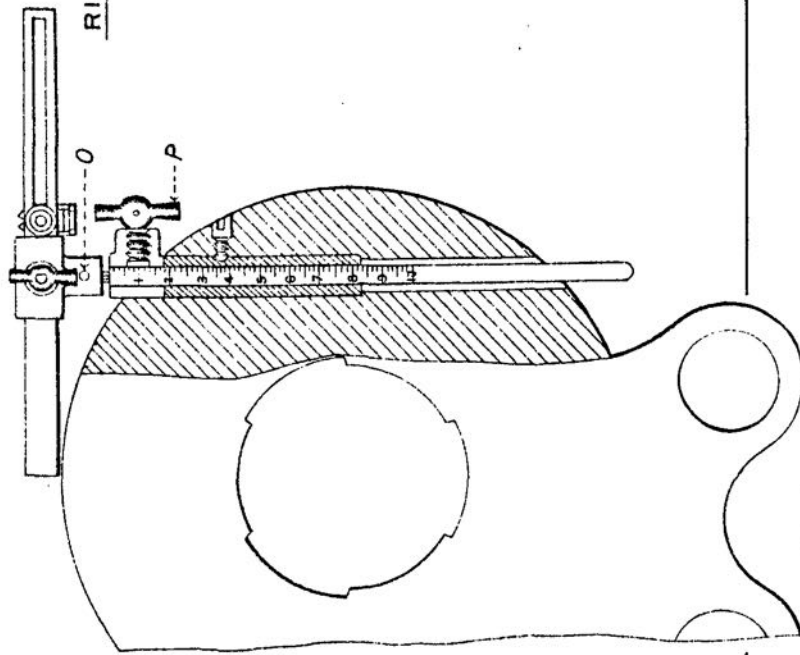
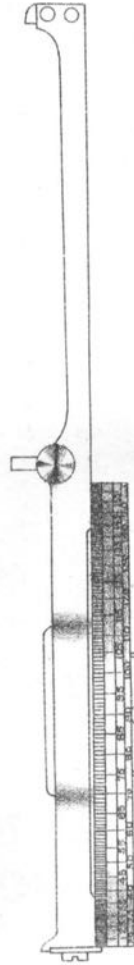
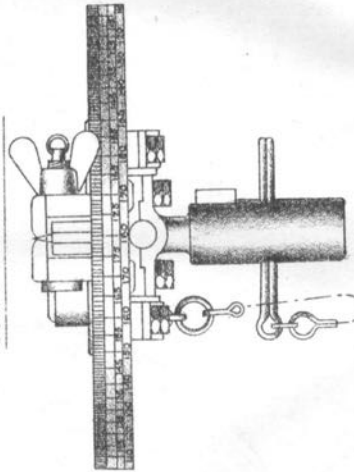
Axletree and Wheels.

The axletree is of tubular steel with 1st class arms; it is secured in position by nuts and screws.

The wheels are 1st class "B" No. 8 (will eventually be superseded by No. 10), 5 feet in diameter, metal flanged, with 12-inch pipe box and 4-inch tire.

3317

Malby & Sons, Lith.

Malby & Sons, Lith

Sighting.

The howitzer is sighted on both sides with crossbar sights. The carriage is also provided with No. 1 dial sight for Movable Armaments, or with No. 4 dial sight and No. 2 sighting telescope for Siege and Territorial Artillery.

Crossbar Sights.

(*Plate VI.*)

The tangent sights drop into sockets in the breech ring of the howitzer, and are set vertically. The vertical bars, which are of steel, are graduated to 10°, adjustment being effected by removable clamps. The sights have bronze heads with clamping screws and a steel horizontal crossbar which slides within the head to the extent of 1° to the right and 3° to the left for deflection. The bar is provided with a sliding reversible leaf having a notch for forward laying; this leaf is provided with a point and crosswire for reverse laying. The bar is graduated from 0 to 6 right for the right side, and 6 to 0 left for the left side. The bars are reversible, being graduated upon one edge for the right side and on the opposite edge for the left side of the piece, and are clamped accordingly.

The sights are adjusted by means of the removable clamp.

The foresights fit into brackets which are attached to the sight ring on the chase of the howitzer by means of a dovetail and fixing screw. The sights are of the drop pattern and consist of a steel stem with horizontal half-crossbar (forged solid), a jacket and socket. The bar is fitted with a sliding reversible leaf, having a point for use with the notch of the tangent sight for forward laying, and a notch and eye hole for reverse laying. The socket is permanently fixed in the foresight bracket by means of a fixing screw passing through the bracket and projecting into the socket. The stem locks into the socket with a bayonet joint, and is prevented from turning by a projection on the jacket which drops into a recess in the sight bracket when the sight is in its true position. The sight cannot be removed without first raising the jacket and turning the stem round a quarter of a circle. The sight is hardened so as to prevent bending when left in position in the howitzer during firing.

The sights are "right" and "left," the horizontal half-crossbars being graduated from 0 to 6 right for the right side, and 6 to 0 left for the left side, respectively, to correspond with the graduations on the crossbars of the tangent sights.

Dial Sight No. 1, Marks I* and II.

(For Howitzers in Movable Armament.)

(*Plate VII.*)

The dial sight consists of a circular carrying plate with degree scale ring, a crosshead and pin, and a sight plate with pointer. The carrying plate is hinged at the centre to the crosshead, and the crosshead is hinged transversely to the crosshead pin. This arrangement admits of an adjustment, right and left, to compensate for any difference that may occur in level of the wheels, and for elevation, or depression, being given to the plate and sight. The degree scale

ring is fixed to the periphery of the carrying plate by screws; it is marked in degrees (white on black for right side, and black on brass for left side), 180 on each side of zero, the required angle being read by means of a pointer fixed to the rear end of the sight plate. Should it be found by examination that when the sight line and axis of the gun are parallel, 0° is *not* indicated, the pointer is so formed as to admit of the required adjustment being made. The sight plate is pivoted to the centre of the carrying plate, and jointed near its centre; the joint pin is provided with a thumb nut for clamping the plate in the extended or folded position; the plate is fitted with an acorn-pointed foresight at the front end, and notched to form a hind sight at the rear end. A clamping screw is provided to fix the sight plate at the required angle.

When in position, the sight is carried in a socket, which is secured in a bracket on either side of the cradle by means of a clamping handle and keep pin, the socket being placed on the right or left side of the carriage, as required. The sight is secured in the socket by a keep pin.

When not in use, the sight is carried in a case on the right side of the trail.

DIAL SIGHT NO. 4, MARKS I AND II.

(FOR HOWITZERS WITH SIEGE AND TERRITORIAL ARTILLERY.)

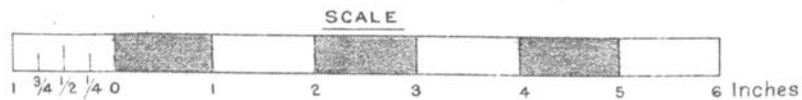
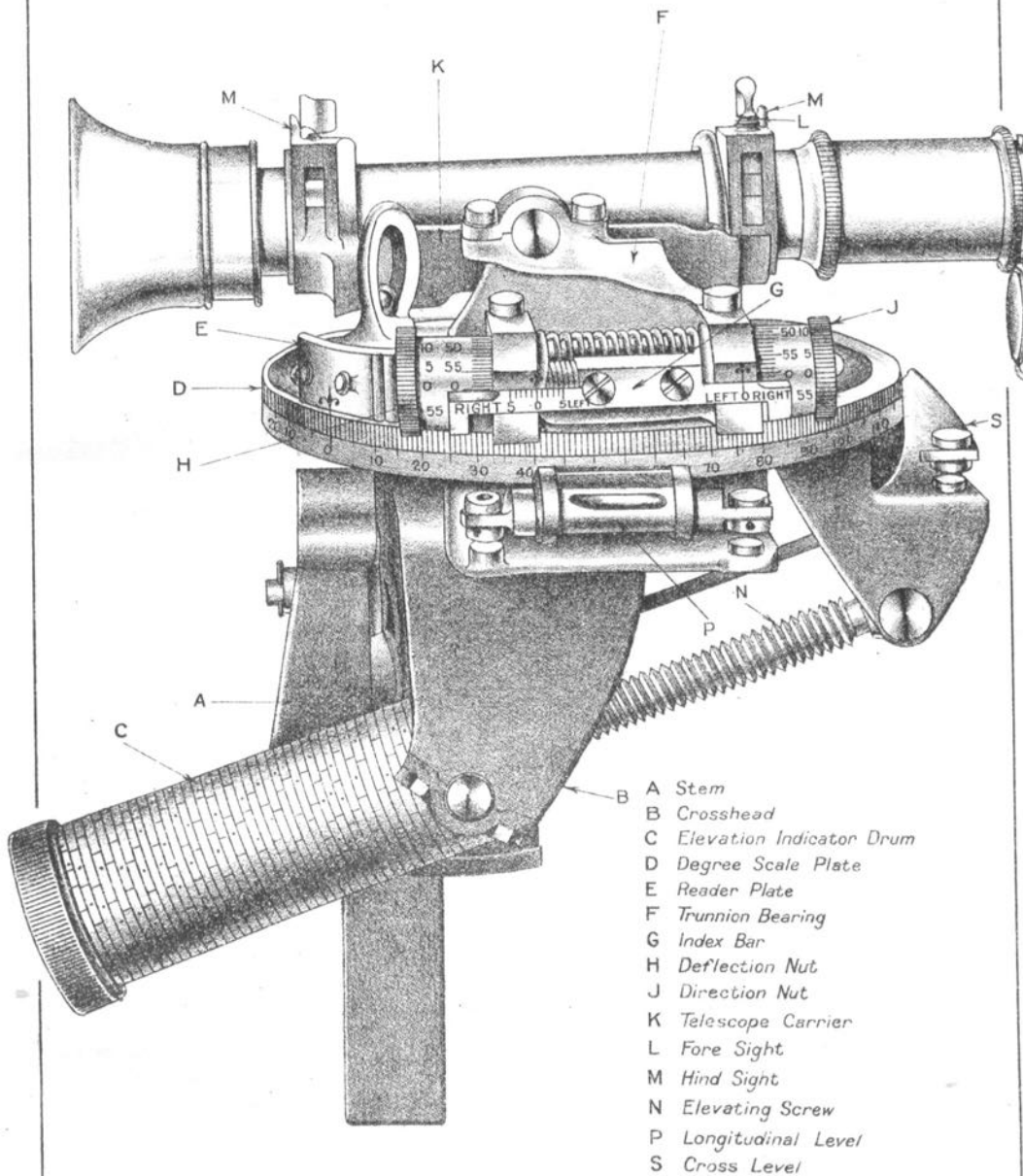
(*Plates VIII and IX.*)

Mark I dial sight consists of a stem, crosshead, and degree scale plate with elevating and cross-levelling arrangements. The stem is formed to carry the crosshead and to fit into the sight bracket bushes on either side of the cradle. The crosshead is pivoted longitudinally to the stem and carries the elevating arrangements. The degree scale plate is pivoted transversely to the crosshead and carries a degree scale ring for indicating angles of direction; the ring is marked in degrees from 0 to 179 in white on black on the right side, and from 0 to 180 in black on brass on the left side.

Deflection is obtained by means of a deflection nut which gives 5 degrees right and left. The degrees and minutes are indicated by markings on the index bar, white on black for right deflection, and black on white for left deflection, and on the deflection nut, white on black for right and black on brass for left deflection.

The telescope carrier is pivoted longitudinally to the trunnion bearing, and is provided with caps and screws for securing the telescope. The front cap is formed with an acorn fore sight and the rear cap with a notched leaf hind sight; these sights are used for rough laying. The carrier may be moved through or clamped within small angles of elevation and depression independently of the motion of the elevating arrangement, and is provided with an index arrow, which, together with a pointer on the trunnion bearing, serves to indicate when the carrier is parallel to the scale plate.

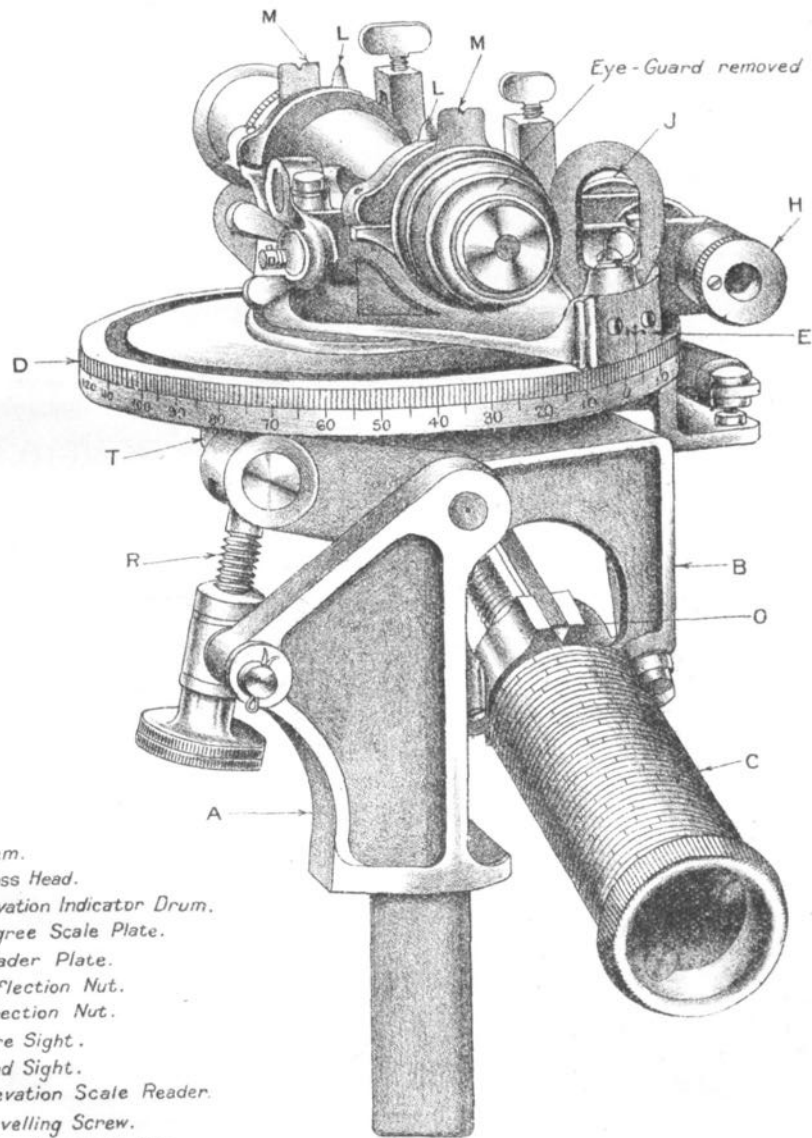
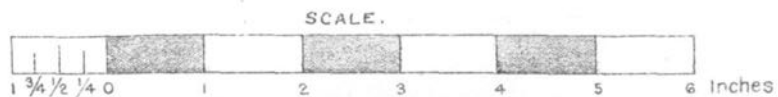
The elevating arrangement consists of an elevation indicator drum and a screw; the former is mounted on a trunnion bearing pivoted to the crosshead and the latter works within the drum and is connected at one end to the scale plate. The drum is provided with

SIGHT, DIAL, No. 4. MARK II.

- A *Stem*
- B *Crosshead*
- C *Elevation Indicator Drum*
- D *Degree Scale Plate*
- E *Reader Plate*
- F *Trunnion Bearing*
- G *Index Bar*
- H *Deflection Nut*
- J *Direction Nut*
- K *Telescope Carrier*
- L *Fore Sight*
- M *Hind Sight*
- N *Elevating Screw*
- P *Longitudinal Level*
- S *Cross Level*

SCALE

1 ¾ ½ ¼ 0 1 2 3 4 5 6 Inches

Malby & Sons Lith.

SIGHT, DIAL, Nº 4, MARK II.

A Stem.
B Cross Head.
C Elevation Indicator Drum.
D Degree Scale Plate.
E Reader Plate.
H Deflection Nut.
J Direction Nut.
L Fore Sight.
M Hind Sight.
O Elevation Scale Reader.
R Levelling Screw.
T Crosshead Axis Pin.

SCALE.

a scale ring graduated in degrees from 0 to 70, and marked in divisions of 5 minutes, each degree and half-degree being figured. The degrees and minutes of elevation are indicated by means of a fixed reader. The backlash due to wear of the threads on the screw and nut (which is in two parts) is automatically taken up by a compressor and spring within the drum.

A longitudinal level fixed to the right side of the sight is used in conjunction with the elevating drum for giving the angle of elevation.

A levelling screw is attached to the stem, and in conjunction with the cross level on the front of the scale plate serves to compensate for difference in level of wheels.

The axis pin of the crosshead is set at an angle of 1° 50′ to the face of the scale plate to compensate for drift.

The cross and longitudinal levels are provided with reflectors, so that the position of the bubbles may be observed from below the height of the levels.

When not in use, the sight is carried in a box secured to the rear of the limber.

Mark II dial sight differs from Mark I principally in the following particulars :—

(1) The axis pin of the crosshead is set at an angle of 3° to the face of the scale plate to compensate for drift.

(2) The levelling screw and nut are larger in diameter.

(3) Each of the telescope caps is fitted with fore and hind sights, so that the carrier can be used for laying back as well as for laying forward.

TELESCOPE, SIGHTING, No. 2.

Particulars.

Magnification	5 diameters.
Field of view	5°.
Length over all	$9\frac{1}{2}$ inches.
Weight	1 lb. 15 oz.

The telescope is of the ordinary erecting type, with an object glass and terrestrial eyepiece.

The body is fitted with two gunmetal collars, which accurately fit the bearings on the sight.

An adjustable diaphragm carrying a needle pointer is fixed between the third and fourth lenses of the eyepiece.

Two marks, one on the body and the other on the focussing ring, when approximated, show infinite focus.

The object glass is protected by a removable ray shade and shutter, and the eyepiece is fitted with a dermatine eyeguard.

To focus the telescope.—First focus the pointer by screwing the eyepiece in or out, until the pointer is clearly defined, then focus the object, if necessary, by revolving the milled ring at the object-glass end. The focussing is correct when the eye can be moved to one side without the pointer going off the object.

Care and Preservation of Telescopes.

See "Regulations for Magazines and Care of War Matériel."

Instructions for Testing and Adjusting the Sights.

Any adjustment required to optical instruments must be carried out by an Armament Artificer.

Before any of the following operations are carried out, the carriage should be placed on a firm platform or on hard level ground, and manipulated until the howitzer is level both longitudinally and transversely. If these arrangements cannot be conveniently made, the base line of the target (Plates X and XI) if used, must be set parallel to the transverse angle of the howitzer.

The howitzer will be levelled by means of a clinometer and a straight-edge placed in the bore.

These instructions are based on the assumption that when the howitzer is level and the elevation indicator drum of No. 4 dial sight set at zero, the degree scale plate is also level longitudinally. A slight error in this latter respect is unimportant, and no means of adjustment is provided.

Testing and Adjusting No. 4 Dial Sight.

(1) *The bubble of longitudinal level should be in the centre of its run when the elevation indicator drum is at zero.*

Test.—Set the elevation indicator drum at zero. The bubble of the longitudinal level should be in the centre of its run.

Adjustment.—Bring the bubble to the centre of its run by means of the capstan headed nuts.

(2) *The bubble of the cross-level should be in the centre of its run when the top bearing surface of the degree scale plate is horizontal.*

Test.—Set the elevation indicator drum at zero, and the reader plate at 90 degrees. Place a clinometer set at zero on the top surface of the degree scale plate, and level the clinometer by means of the cross-levelling screw until the bubble of the clinometer is in the centre of its run. The bubble of the cross-level should be in the centre of its run.

Adjustment.—Bring the bubble to the centre of its run by means of the capstan headed nuts.

(3) *The trunnion bearings of the telescope carrier should be horizontal when the degree scale plate is horizontal.*

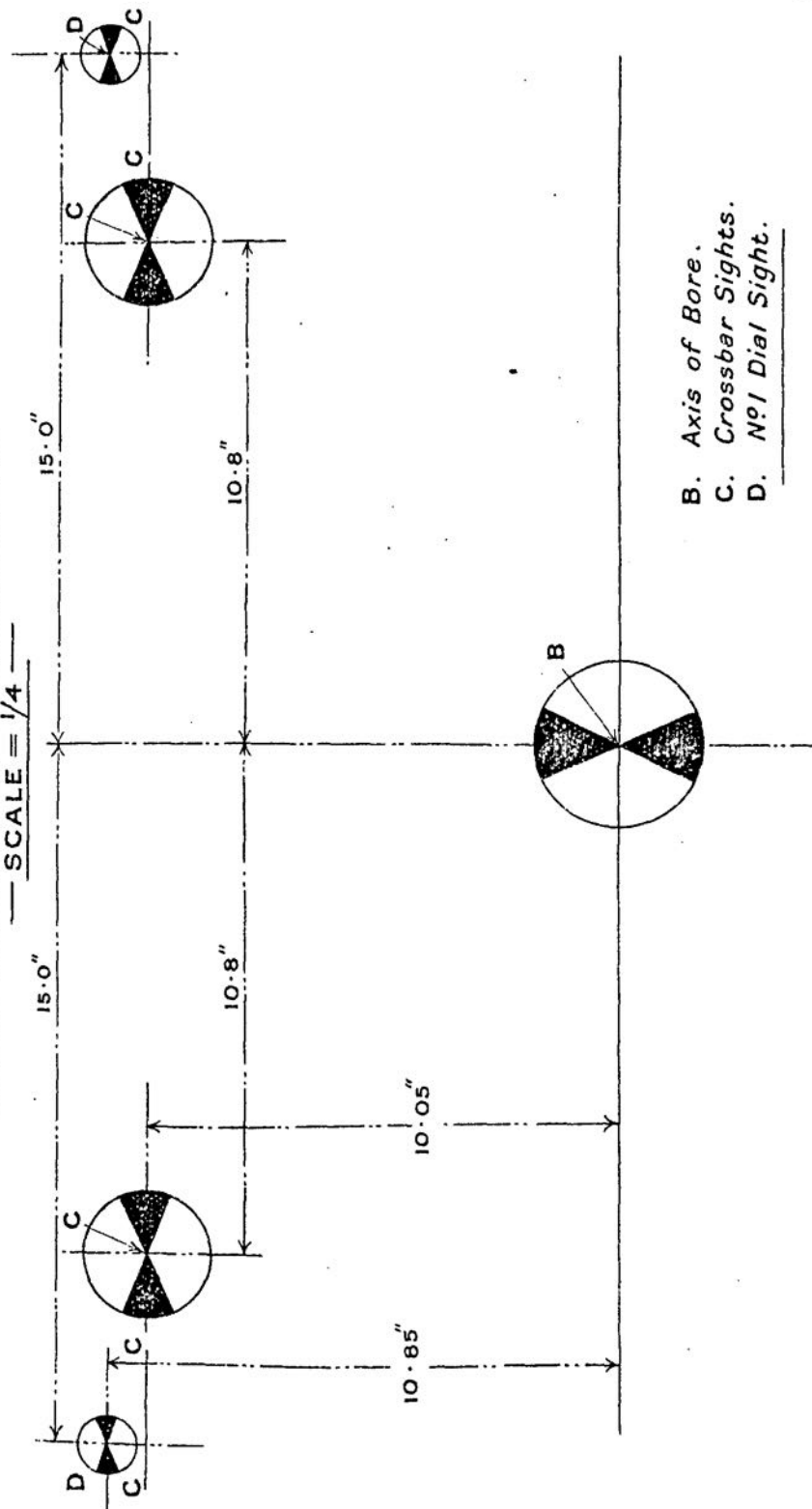
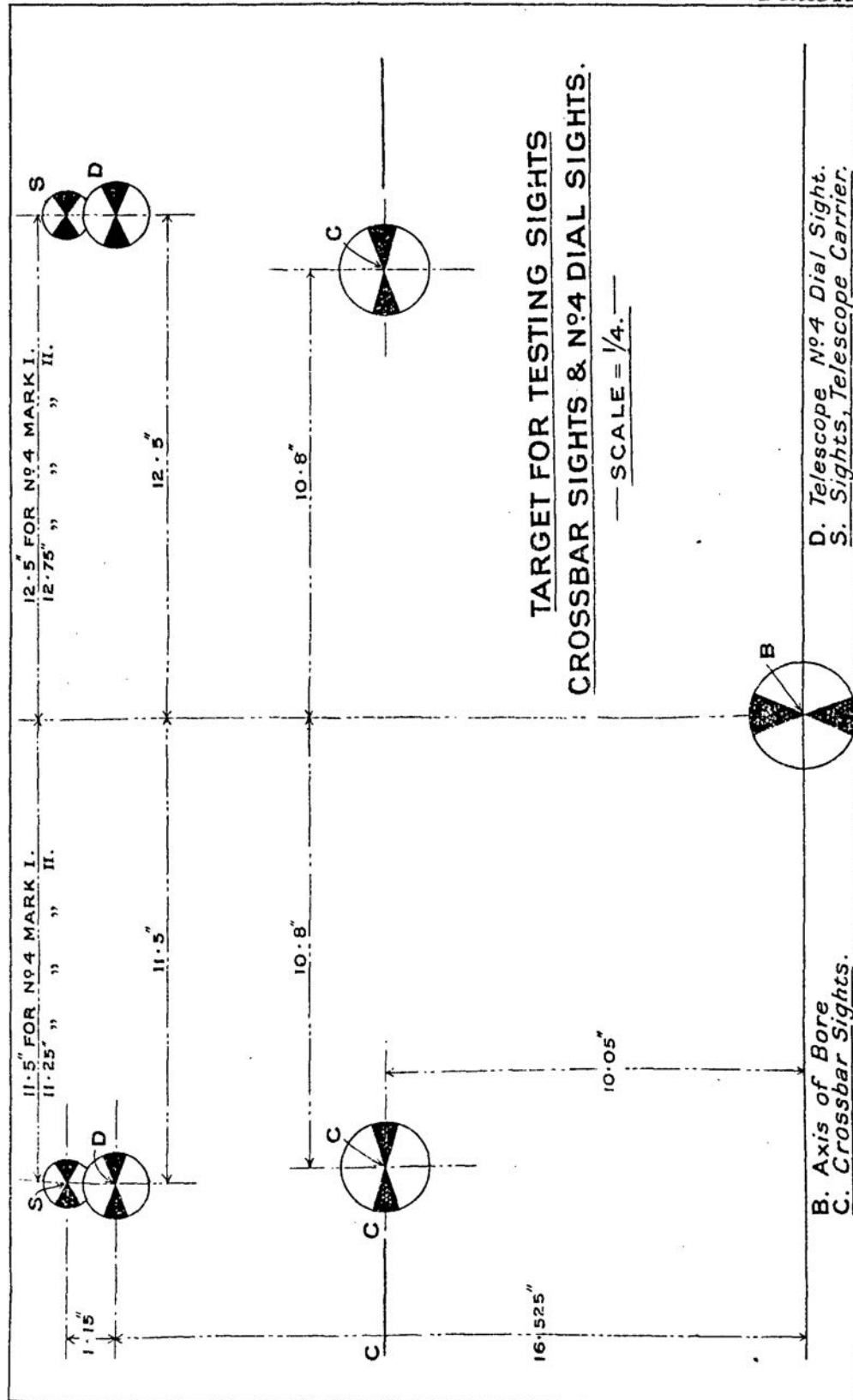
Test.—Suspend a plumb line about 20 yards from the front of the howitzer. Clamp the reader plate at zero. Traverse the howitzer until the pointer of the telescope is on the plumb line. Bring the bubble of the cross-level central by means of the cross-levelling screw. Slacken the thumb nut which clamps the telescope carrier to the trunnion bearing. The pointer of the telescope should remain on the plumb line when the telescope carrier is elevated or depressed (without using the elevation indicator drum).

TARGET FOR TESTING SIGHTS
CROSSBAR SIGHTS & Nº I DIAL SIGHT.

— SCALE = 1/4 —

B. *Axis of Bore.*
C. *Crossbar Sights.*
D. *Nº I Dial Sight.*

3517
Malby & Sons, Lith.

Malby & Sons, Lith.

Adjustment.—Adjust the bearings of the trunnions of the telescope carrier by scraping.

(4) *Collimation.—The optical axis of the telescope should coincide with the mechanical axis.*

Test.—Select a well-defined object at a distance of not less than 400 yards. Loosen the hinged caps of the telescope carrier slightly. Lay the point of the telescope on the object and revolve the telescope in its bearings. The pointer should remain on the object.

Adjustment.—Remove the breech end of the telescope and the cover which protects the diaphragm screws, and replace the breech end. Revolve the telescope, carefully noting the direction of the error. With the tommy provided for the purpose draw the pointer in the required position by loosening and tightening the opposite screws of the diaphragm, carefully revolving the telescope after each adjustment until the pointer remains on the object. Replace the diaphragm cover.

(5) *The line of sight through the open sights on the caps of the telescope carrier should be parallel to the optical axis of the telescope.*

Test—Lay the pointer of the telescope on the object used in test (4). The fore and hind sights on the telescope carrier should be on the same object, or on circle S of the target.

Adjustment.—File the fore and hind sights until correct.

Alignment Tests.

In order to carry out the tests for alignment it is necessary to obtain a line of sight along the axis of the bore of the howitzer. A point at the muzzle is obtained by stretching two fine cords along the vertical and horizontal axis lines cut on the muzzle of the howitzer, their point of intersection being on the axis line. The axial vent is used as a sighting hole at the breech end.

Select a clearly defined object at least a mile away to lay on, or, if this is not available, construct a target with circles on it, each circle divided into black-and-white sectors, the centres of the circles being the points to lay on (*see* Plates X and XI). Set the target up at a distance of about 50 yards from the howitzer. Lay the axis of the howitzer on point B.

Crossbar Sights.

(6) *Test.*—Set all sliding leaves at 3 on the main scales, and the deflection scale of the hind sight at zero. The acorn of the fore sight should be on the object or circle C of the target, when viewed through the notch of the hind sight.

Adjustment.—If great accuracy is required move the deflection leaf of each sight until the sights are on the object, or on circle C; erase the arrow on the leaf and re-mark it opposite 3 on the main scale.

(7) *Test for straightness of the crossbar.*—Move the sliding leaves to 6 on the main scale. The line of sight should still fall on the object, or on line CC of the target.

Adjustment.—Adjust the lower of the two crossbars until the line of sight is correct. This adjustment should not be carried out unless absolutely necessary.

No. 4 Dial Sight.

(8) *Test.*—Set the elevation indicator drum; deflection and direction nuts, and the reader plate at zero, and the index arrow on the telescope carrier to coincide with the pointer on the trunnion bearing. The pointer of the telescope should be on the object.

Adjustment for error in direction.—If the pointer of the telescope is off the object, slacken the thumb nut which secures the telescope carrier in position. With an ordinary ⅜-inch spanner slacken the locking nuts on the adjusting screws in the sight bracket attached to the cradle of the carriage. With spanner No. 263 adjust the bush in the sight bracket by means of the adjusting screws, until the pointer of the telescope is on the object, or on circle D of the target. The screws must be tightly clamped on the lug of the bush before this operation is completed. Tighten up the locking nuts and the thumb nut.

(9) In cases where not more than one degree of error exists slacken the clamping nut of the reader plate. Move the telescope and carrier until the pointer of the telescope is on the object, or on circle D of the target. Tighten up the clamping nut on the reader plate, and adjust the position of the reader so that the arrow coincides with zero on the degree scale plate.

(10) *For vertical error.*—If the arrow on the telescope carrier does not coincide with the pointer on the trunnion bearing after adjustment for direction is completed, erase the arrow on carrier and re-engrave it to coincide.

Tests and adjustments Nos. 8 and 9 should be carried out with the sight in each of the two sight brackets.

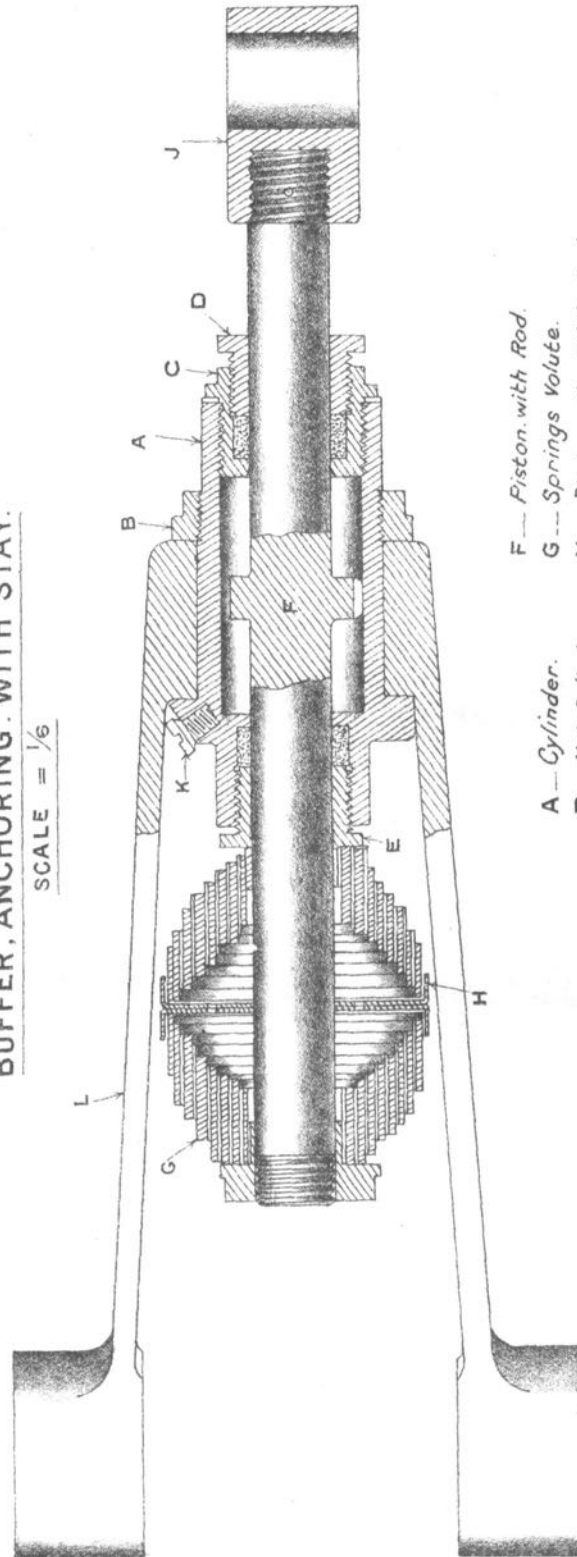
Travelling Position.

For travelling, the howitzer is housed by disconnecting the piston rods from the breech ring of the howitzer, and allowing it to slide back so that the projections on the breech ring may rest in a hinged bracket† fitted to the bottom of the carriage; the elevating gear is then clamped to prevent any movement of the cradle. The anchoring buffer is removed from the carriage, and the stay is hooked up to the suspending chain. The method of removing the buffer is explained in the "Regulations for Magazines and Care of War Matériel."

† This bracket should always be turned back during firing, as at angles of elevation it is liable to damage on recoil.

CARRIAGE, SIEGE B.L. 6-INCH, 30 CWT, HOWITZER.

BUFFER, ANCHORING. WITH STAY.

SCALE = 1/6

A — *Cylinder.*
B — *Nut Cylinder.*
C — *Box Stuffing.*
D — *Gland Front.*
E — " *Rear.*
F — *Piston with Rod.*
G — *Springs Volute.*
H — *Plateparting Volute Springs.*
J — *Crosshead.*
K — *Plug filling Hole.*
L — *Stay Anchoring Buffer.*

Malby & Sons, Lith.

Buffer, Anchoring, B.L. 6-inch 30-cwt. Howitzer Carriage.

(Plate XII.)

The anchoring buffer, which is connected to the carriage axletree by a stay, and to the radial arm of the pivot plate by a crosshead, consists of a steel cylinder, glands, piston with a rod at each end, and volute springs; the lower end of the piston rod is connected to the crosshead and the upper carries the volute springs; the piston is thus stationary and the cylinder free to move with the carriage on recoil. On firing, the cylinder is drawn with the carriage by means of the stay, thus checking the recoil and compressing the springs; the energy thus stored up in the springs causes the carriage to return to the firing position.

When travelling the buffer is carried with the double-decked platform, and is never to be in its stay, except when the howitzer is mounted on its firing platform.

Contents of buffer, 1 quart.

Ropes, Check, B.L. 6-inch Howitzer, Nos. 1 and 2.

The check ropes are for use with carriages when without holdfasts or platforms.

The ropes are made of galvanized steel wire rope, the ends being fitted with eyes and thimbles.

No. 1 check rope is for use with carriages which are provided with elongated holes at the rear end of the trail, *i.e.*, carriages from which the traversing gear has been removed.

It consists of two wheel ropes, each 2 feet 8½ inches long overall, for passing round the felloes of the wheels, and one coupling rope, 7 feet 8·15 inches long, with a hook at one end and a que at the other, for passing through the elongated holes at the end of the trail and connecting the wheel ropes.

No. 2 check rope is for carriages which have not elongated holes in sides at rear end of trail.

It consists of two wheel ropes, and a coupling rope same as for No. 1, also one lengthening rope, 3 feet 7·875 inches long overall, with a hook at one end for connecting a wheel rope with a coupling rope. The coupling rope is passed through the trail eye.

Drag shoes No. 1 with wire rope connections are used in place of check ropes at Malta.

Carriages at Gibraltar are provided with drag shoes in place of check ropes. For this purpose "Shoes, drag, No. 11" are attached to the existing wire wheel ropes and fitted to the carriages. Each wire rope is attached to the drag shoe by a shackle and two links, and to a bar passing through the elongated holes in the rear of the trail by a shackle.

Carriage, Siege, Top.

(*Plate XIII.*)

The top carriage consists of two plate side brackets, each formed with a trunnion bearing in the upper part (for the trunnion arms of the cradle), and a front transom of cast steel; the brackets are connected to the Siege Carriage by pins and the front transom. The elevating gear is the same as that used with the Siege Carriage, but with the addition of an extending spindle, which is keyed between the worm spindle and the handwheel. A step is provided to facilitate loading.

Elevation varying from 35° to 70° can be obtained when the top carriage is connected to the Siege Carriage and used as a howitzer bed, but on an emergency the top carriage can be safely fired from, at any elevation.

In travelling, the top carriage is carried separately.

Limber.

(*Plate XIV.*)

The limber consists of a steel frame, and a limber box mounted on a second class axletree and two wheels, an axletree bed, and shafts, single and framed.

The frame consists of three futchels, connected to the axletree bed at the rear, and a splinter bar at the front. A footboard and platform board are fitted on the top of the futchels and a limber hook to the axletree bed, and two outriggers for 4 horse draught, to the splinter bar.

The axletree bed is of wrought iron, and with the axletree constitutes a beam of box girder section.

The wheels are 2nd class, "C," No. 35A, 5 feet in diameter, double spoked, having a 3-inch tire with rounded edges. The nave consists of two flanges of corrugated steel, connected by 14 bolts; the inner flange is fitted with a steel ring to strengthen it, and the outer flange with a metal centring ring; the pipe box is passed through the flanges and is secured by a nut, which is prevented from working loose by a steel spring catch fixed to the centring ring and engaging with the ratchet formed on the securing nut.

The shafts are one pair "near" and "off," and a pair of framed shafts; the "near" and "off" shafts pass through staples on the splinter bar; the near shaft is secured by a pin to the inner futchels and the off to the axletree arm. The frame shafts are attached to the splinter bar. Fittings are provided for the attachment of a No. 2 engine draught connector. A certain number of carriages and limbers have been fitted with arrangements for travelling in series, and for this purpose the No. 2 connector will be used.

The limber is fitted to carry the "Box, limber, siege, B.L. 6-inch 30-cwt. howitzer." This box is of deal, with elm ends, and is fitted with nib irons and staples for securing it to the limber. The box is arranged internally to carry the stores shown on packing diagram B, page 43. Dimensions (over all), 4 ft. 2½ in. by 1 ft. 5 in. by 1 ft. 7¼ in.

CARRIAGE, SIEGE, TOP, B. L. 6-INCH, 30 CWT. HOWITZER.

SCALE – 1/16.

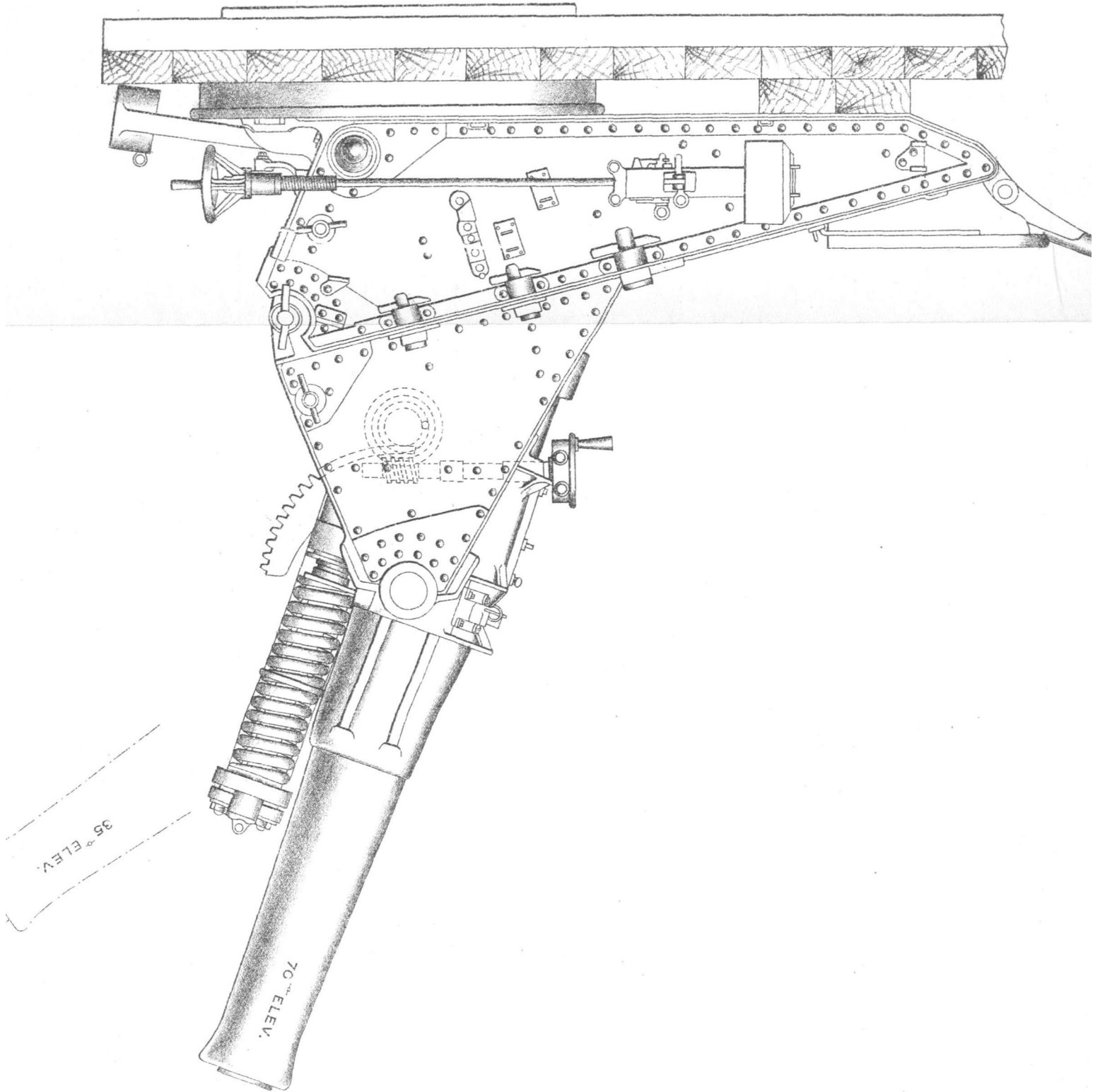
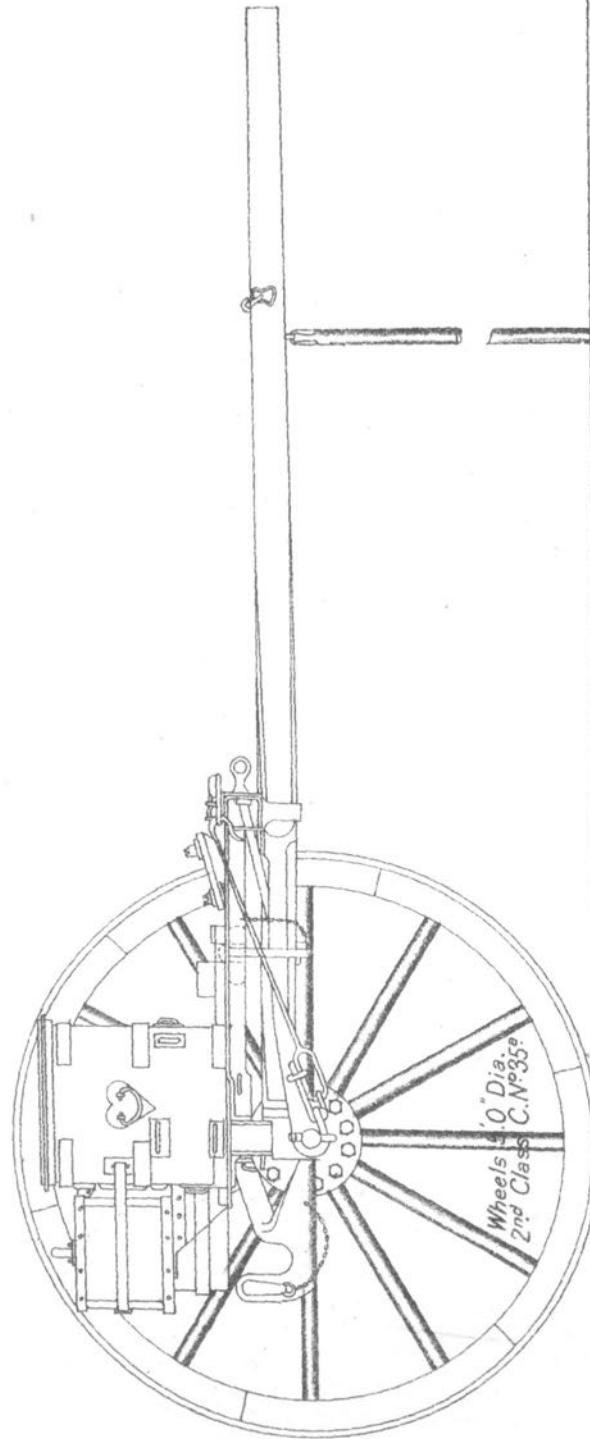



Plate XIV.

3517.

Malby & Sons, Lith.

Box, Store.

This box is generally similar to the limber box, and one is allowed to every 10 howitzers or less number.

It is arranged internally to carry the spare parts of the howitzer shown on page 40. Dimensions (over all), 4 ft. 2½ in. by 1 ft. 5 in. by 1 ft. 7 in.

Dimensions, Weights, &c.

Dimensions, &c.

	ft.	in.
Carriage and Limber—		
Height to axis of howitzer, from platform, without wheel plates	4	0
Height to axis of howitzer, top carriage (from pivot plate)	4	10
Length, carriage and limber, with howitzer	23	1
Length, carriage and limber, without howitzer	21	7
Length, axletree, carriage	6	5
Length, axletree, limber	6	3½
Length, between axletrees	8	5
Greatest projection beyond track of wheels, carriage (each side)	0	7½
Greatest projection beyond track of wheels, limber (off side)	0	9
Width, maximum, carriage	6	5
Width, maximum, limber	6	4
Wheels, track, carriage, No. 8	5	2
Wheels, track, limber	5	2
Wheels, diameter, carriage, No. 8	5	0
Wheels, diameter, limber	5	0
Space required to turn in	31	0

	degs.	mins.
Angle of trail, carriage on ground (top side)	37	0
Angle of trail, limbered up (top side)	21	0
Angle of lock	40	0
Angle of elevation	35	0
Angle of elevation with top carriage	70	0
Angle of depression	10	0

Weights.

	cwt.	qrs.	lbs.
Carriage, with wheels	38	3	0
Carriage, without wheels	31	3	0
Carriage, packed	69	3	8
Carriage, top	7	0	0
Carriage, trail on limber hook	9	2	7
Limber, empty (without wheels)	10	1	26
Limber, packed	14	2	6
Limber, points of shafts (2 pairs)	1	2	0
Limber, point of off shaft	0	2	16
Limber, point of draught pole	0	1	24
Carriage, with limber packed, on fore wheels	15	0	22
Carriage, with limber packed, on hind wheels	69	3	8
Wheels, 1st class "B," No. 8 ... each	3	2	0
Wheels, 2nd class "C," No. 35A ... "	1	3	10
Cradle, buffers, filled	12	1	26
Complete equipment behind team	85	0	2

	tons.
Tonnage, for shipment, carriage and limber	8·825
Tonnage, for shipment, carriage	5·59
Tonnage, for shipment, limber	3·88
Tonnage, for shipment, top carriage	0·958
Tonnage, for transport, carriage and limber	14·97
Tonnage, for transport, carriage	7·85
Tonnage, for transport, limber	6·64
Tonnage, cradle	0·835
Tonnage, limber box	0·239
Tonnage, box, stores	0·235

PLATFORM, SIEGE, DOUBLE-DECKED, MARK II.

The platform consists of two layers of 3-inch deal planks, the bottom layer being parallel to the line of fire, the upper layer at right angles to it. Under the bottom layer are placed three transverse planks (or transoms) similar to those in the top layer, as shown in the plate. Under the front is bolted an oak baulk, 9 inches square, to receive the eyebolts of the holdfast. The two layers of planks are secured to the transoms by 8-inch bolts, and to the front baulk by 14-inch bolts. A riband of deal 6 inches by 3 inches is placed on top of the outer edges of the planks on each side of the platform, and bolted through to the transoms by three 12-inch bolts, and to the front baulk by an 18-inch bolt.

A thin washer plate for each bolt is placed under the pivot plate on top of the upper planks, and on top of the transoms under the bottom planks, which, by means of split keys passing through the bolts, prevent the bolts slipping down while the nuts are being screwed up.

A steel binding plate, 4 in. by $\frac{3}{8}$ in., is attached to each outer side of the platform by thirteen $\frac{1}{2}$-inch coach screws, 3 inches long.

The platform consists of the following parts:—

Parts	Description	No.
Baulks, oak,	12 ft. by 9 in. by 9 in.	1
Planks, deal,	12 ft. by $8\frac{1}{2}$ in. by 3 in.	16
	12 ft. by 6 in. by 3 in.	2
	12 ft. by $8\frac{3}{4}$ in. by 3 in.	19
Plates, steel,	6 in. by 3 in. by $\frac{1}{8}$ in., for $1\frac{1}{4}$-in. bolt (pivot plate)	12
	6 in. by 3 in. by $\frac{1}{8}$ in., for 1-in. bolt	8
	12 ft. by 4 in. by $\frac{3}{8}$ in., with holes for 12 coach screws	2
	3 ft. by 3 in. by $\frac{1}{8}$ in., for four 1-in. bolts... each	4
Bolts, square head, 1-in. diameter,	18 in. long, with nut, washer, and split key	2
	14 in. "	4
	12 in. "	6
	8 in. "	12
Cups, for heads of bolts	... ...	24
Screws,	coach, $\frac{1}{2}$-in. by 3-in.	26
	coach, $\frac{1}{2}$-in. by 5-in.	8
	iron, flat head, 1-in., No. 12	108

Spanners (Nos. 156 and 185) are provided for use in laying down the platform.

HOLDFAST, PLATFORM, SIEGE, DOUBLE-DECKED, MARK II.

The holdfast consists of an oak plank, to which are attached three eyebolts with tie rods; these are connected by coupling nuts to similar tie rods and eyebolts attached to the front baulk of the platform.

The holdfast consists of the following parts:—

Parts	Description	No.
Plank, oak,	12 ft. by 12 in. by 4 in.	1
Rods, tie,	long; with eyebolts, with collars and nut...	3
	short; " " " ...	3
Nuts, coupling, tie rods	... ...	3

A tommy (No. 31, $1\frac{1}{2}$ in. by 18 in.) is provided for screwing up the coupling nuts.

Plate, Pivot, Double-decked Platform, Mark II.

The pivot plate is a circular steel casting, with a hole bored in the centre to suit either the pivot plug or the boss of the radial arm. It is secured in position on the double-decked platform by 12 bolts which pass through the planks, and a circular steel holding down plate on the underside of the platform.

Dimensions, &c.

Weight (with plugs and bolts) ...	11 cwt. 1 qr. 10 lbs.
Tonnage	0·3475 ton.
Dimensions (over all)...	4 ft. 1 in. by 10 in.

Arm, Radial, Pivot, Double-decked Platform, Mark II.

The radial arm is a steel casting with a clip formed at the front end to grip the projecting rim of the pivot plate, and so prevent the arm lifting when firing. It is secured to the pivot plate by one clamping and two jamming screws; the clamping screw can be readily removed to admit of the arm being placed in different positions to suit any angle of traverse.

Dimensions, &c.

Weight	2 cwt. 0 qrs. 5 lbs.
Tonnage	0·989 ton.
Dimensions (over all)	3 ft. 4¾ in. by 1 ft. 7¾ in. by 8½ in.

Plate, Wheel, Platform, Siege.

The wheel plates are of steel. One is placed under each wheel of the carriage to protect the upper layer of the platform.

Dimensions, &c.

Weight	1 cwt. 2 qrs. 4 lbs.
Tonnage	0·0094 ton.
Dimensions ...	6 ft. 0 in. by 1 ft. 6 in. by ½ in.

Plank, Traversing, B.L. 6-inch Howitzer.

The plank is of oak 18 in. by 4 in. by 5 ft.; it is made in two pieces (each 9 in. by 4 in. by 5 ft.), which are connected by dowels and rivets. A steel plate is riveted to the upper surface of each plank to take the rub of the trail of the carriage. The plank is placed across the double-decked platform for the trail of the carriage (when used as a bed) to slide on, or placed under the centre of the trail.

Plug, Pivot, No. 18, Mark II.

The pivot plug is used for securing the carriage trail to the pivot plate (page 23) when the carriage is used as a bed. The plug is a steel forging with a screw thread at its lower end for the "Nut, pivot, plate double-decked platform," by which it is secured to the pivot plate. The upper end is formed to pass through the carriage trail which is secured to it by a nut, collar, and three disc springs (No. 61).

CARE AND PRESERVATION OF CARRIAGE, &c.

See "Regulations for Magazines and Care of War Matériel."

List of Lubricating Holes.

Fittings which are provided with Oil Holes for Lubricating purposes.	No. of Holes.	Position of Holes.
Capsquares... ... ... each	1	On top.
Cradle	2	On top, for oiling sliding surfaces.
Bearing pivot, handwheel brake gear	1	Near the handwheel, front of carriage.
Guard, worm wheel, elevating ...	1	In brass tube of guard, left side of carriage, conveying lubricant to worm wheel and pinion.
Nut, clamp, elevating gear ...	1	In nut, left side of carriage.

Note.—In order to assist in identifying the position of the lubricating holes, the heads of the screws should be kept free from paint.

AMMUNITION.

Projectiles.														Cartridges.				Means of Firing.
Description.	Marks.	Howitzer for use with	Weight, filled and fuzed.		Bursting Charge.				Nature of Fuze.					Nature.	Weight.		Size.	
					Nature.	Weight.												
		Mark.	lb.	oz.		lb.	oz.								lb.	oz.		
Shell, B.L., high explosive, 6-inch howitzer— Light	I, II	I*	100	0	Lyddite	—			Percussion D.A. Nos. 1, 17 or 44.									
†Heavy	*I, II, III*	I or I*	122	9	,,	—												
Shell, B.L. or Q.F., high explosive, 6-inch gun	*VIII*, XI	I or I*	100	0	,,	—			T. and P. No. 82, or T. and P. Nos. 54 or 62 with adapter.									
Shell, B.L., shrapnel, 6-inch howitzer, light	I	I*	100	0	R.F.G.²	0	10½											
Shell, B.L. or Q.F., shrapnel, 6-inch	*II*	I	100	8	,,	0	7		T. and P. Nos. 54 or 62					Cordite M.D.	(a) 2	8½	4¼	
	IV and *V*	I	100	8½	,,	0	10½							Cordite	(b) 1	15½	5	
	I*, *VI*, *VII*, *VIII*, *IX*	I*	100	8½	,,	0	10½							Cordite	(c) 1	12	5	
	XII	I*	100	0	,,	0	10½		T. and P. No. 82, or T. and P. Nos. 54 or 62 with adapter.									
	XIV	I*	10[illegible]	0	,,	0	10½											Tube, friction, T, Marks I to IV*.
Projectile, practice, B.L., 6-inch howitzer, heavy iron	*I, II, III*, IV	I	122	9	L.G.	9	7		Percussion D.A. with cap, No. 1									
Projectile, practice, B.L., 6-inch howitzer, light iron	I	I*	100	0	,,	4	5¾							Cordite M.D.	(d) 1	3	4¼	
Shell, B.L., star, 6-inch howitzer...	I	I or I*	57	4¾	R.F.G.²	10 drs.			Time, 15 secs., No. 25					Cordite	(e) 1	0	5	
——	—	—	—		—	—			—					Blank L.G.	5	0	—	

Items printed in italics are obsolescent.

† Obsolete when existing stock is used up.
(a) For use in Mark I* howitzers with light shell.
(b) ,, ,, I* ,, heavy ,,
(c) For use in Mark I howitzers with heavy shell.
(d) ,, ,, I* ,, star ,,
(e) ,, ,, I ,, ,, ,,

CARTRIDGE, B.L. 6-INCH 30-CWT. HOWITZER, 2-LB. 8½-OZ.
CORDITE, M.D., SIZE 4¼, MARK I.

(*Plate XV.*)

This cartridge consists of a core and three rings of cordite, M.D., size 4¼, each being contained in a shalloon bag.

The core consists of 15½ ounces of cordite, M.D., made up in a bundle, with a ring of cordite, M.D., to form a base, to which an igniter consisting of 12 drams of R.F.G.² powder is fixed.

The rings, which consist of 3½ ounces, 8½ ounces, and 13 ounces of cordite, M.D., respectively, are fitted over the core, and secured to it by pieces of silk or shalloon braid.

CARTRIDGE, B.L. 6-INCH 30-CWT. HOWITZER, 1-LB. 15½-OZ.
CORDITE, SIZE 5.

(*Plate XVI.*)

The *Mark II* cartridge is made up similarly to the 2-lb. 8½-oz. cartridge, except that the core consists of 14-oz. cordite; it has also four rings consisting of 2-oz., 4-oz., 8-oz., and 3½-oz. cordite, respectively. The igniter consists of 12 drams of S.F.G.² powder.

The *Mark I* cartridge differs from the Mark II in having an igniter consisting of 2½ drams of guncotton yarn.

CARTRIDGE, B.L. 6-INCH 30-CWT. HOWITZER, 1-LB. 12-OZ.
CORDITE, SIZE 5.

The *Mark IV* cartridge differs from the Mark II 1-lb 15½-oz. cartridge in not having the 3½-oz. ring.

The *Mark III* cartridge differs from the Mark IV in the igniter consisting of 2½ drams of guncotton yarn.

The *Mark. II* cartridge is also similar, but has an igniter of 12 drams R.F.G.² powder.

CARTRIDGE, B.L. 6-INCH 30-CWT. HOWITZER, 1-LB. 3-OZ.
CORDITE, M.D., SIZE 4¼.

This cartridge consists of the core and 3½-oz. ring of the 2-lb. 8½-oz. cartridge.

CARTRIDGE, B.L. 6-INCH 30-CWT. HOWITZER, 1-LB.
CORDITE, SIZE 5.

This cartridge consists of the core and 2-oz. ring of the 1-lb. 15½-oz. cartridge.

CARTRIDGE, B.L. 6-INCH HOWITZER, 5-LB. BLANK L.G.,
MARK II.

This cartridge is made of No. 1 class silk cloth choked with silk and having two hoops of silk or shalloon braid.

Length not to exceed 6·5 inches.

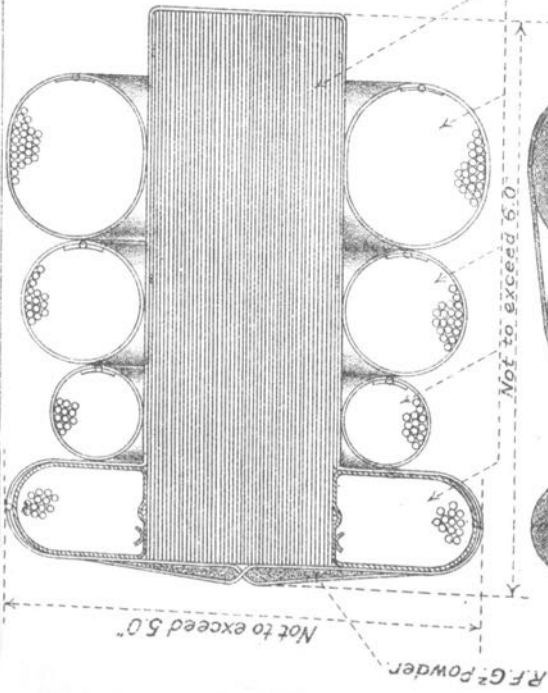
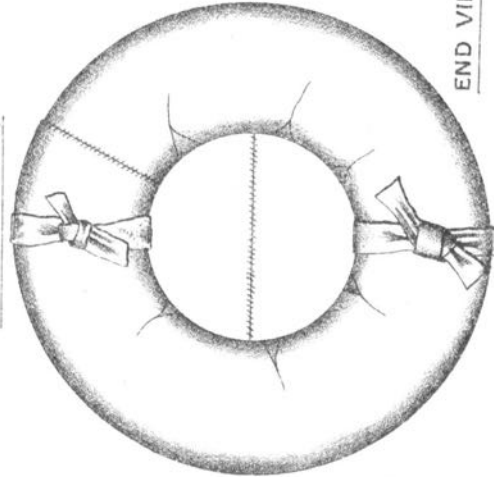
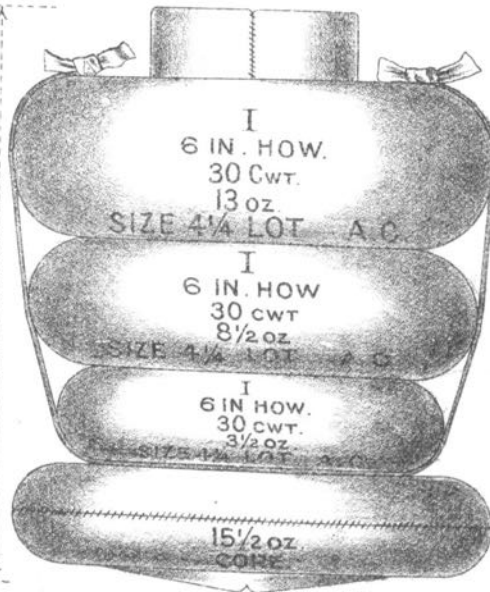
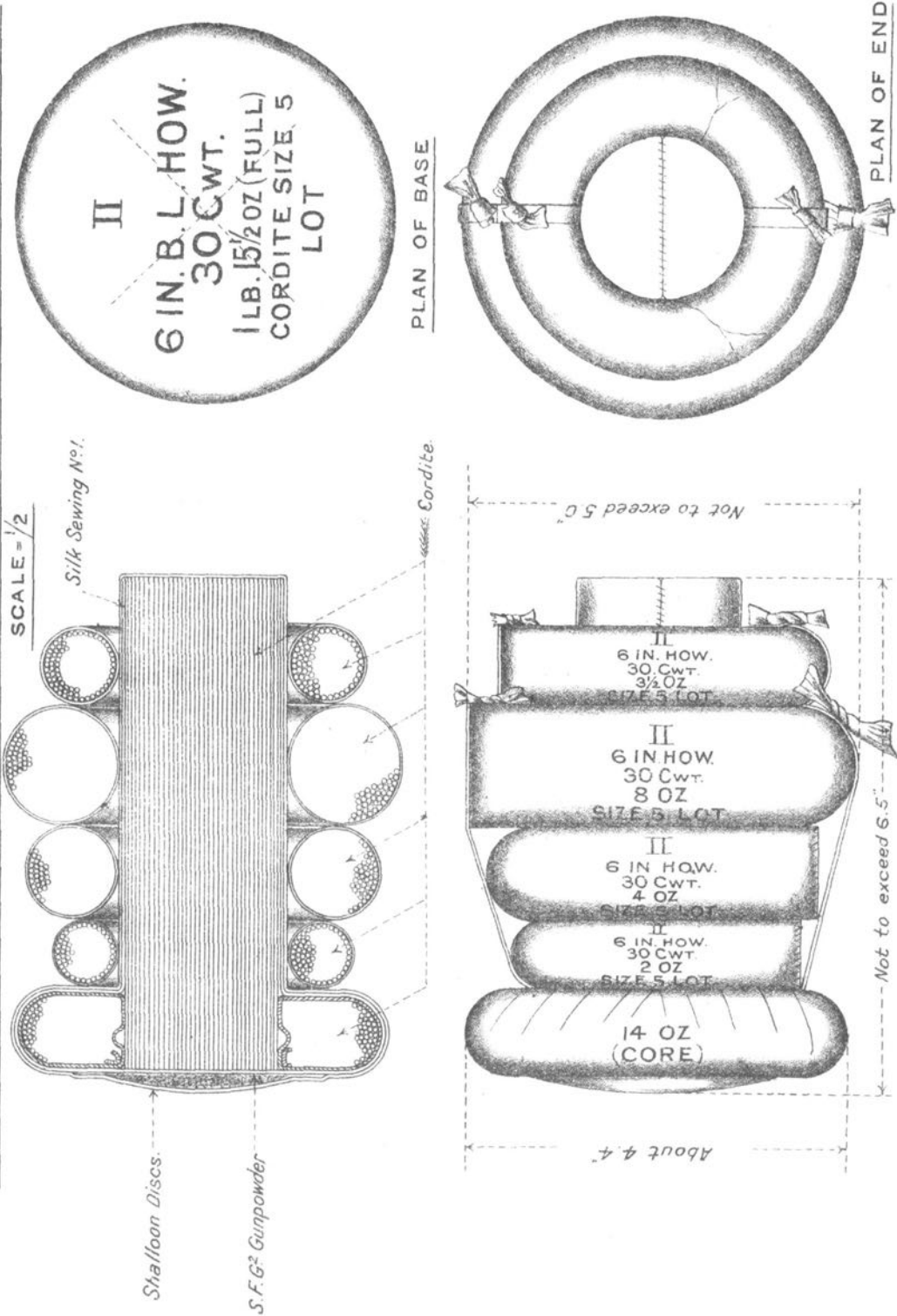
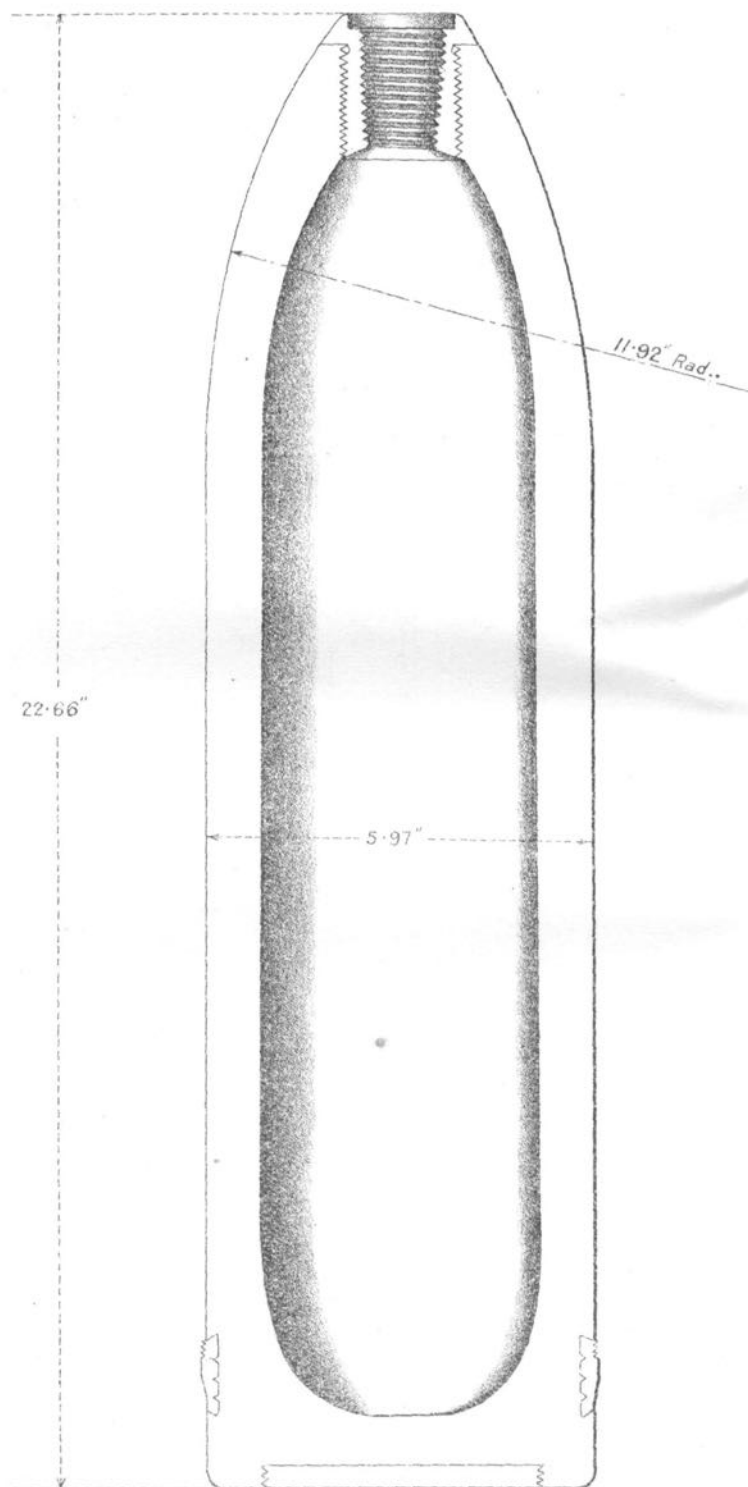
Diameter not to exceed 6 inches.

CARTRIDGE: B.L. 6 INCH 30 CWT HOWITZER, 2 LB 8½ OZ CORDITE, M.D. SIZE 4¼, Mk I.

Malby & Sons, Lith.

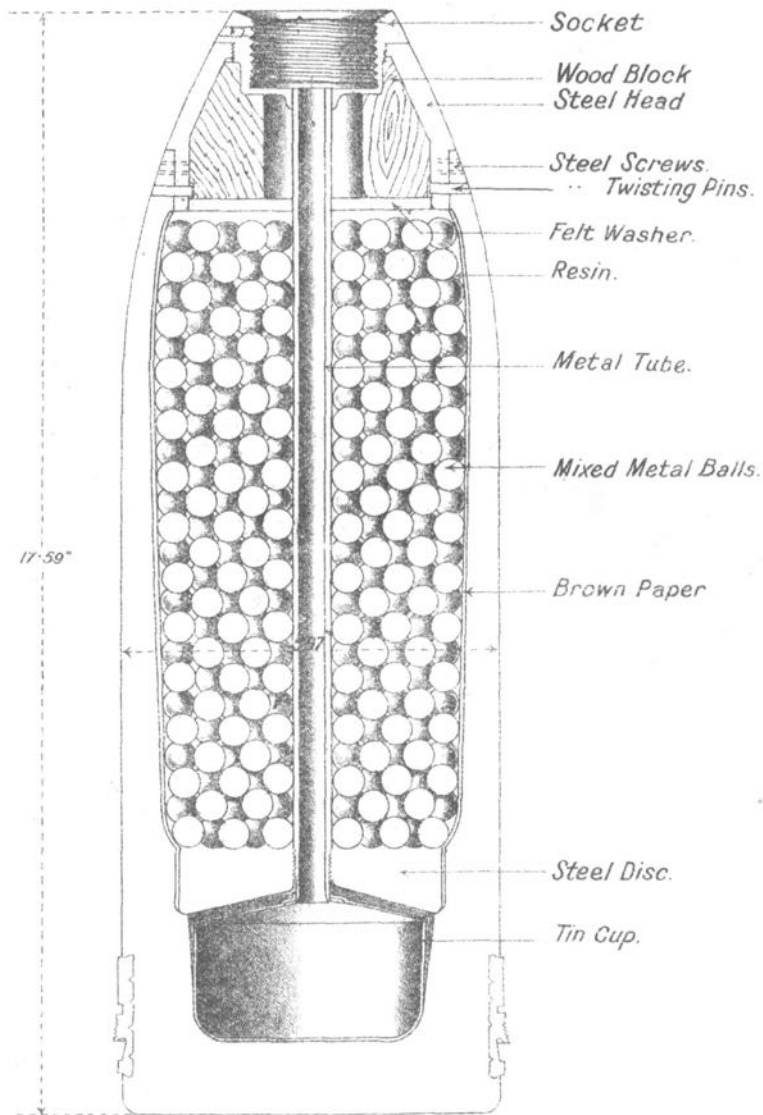
Plate XVI.

3517

Malby & Sons, Lith

SHELL, B.L. HIGH EXPLOSIVE, 6-INCH, HOWITZER, LIGHT, MARK II.
SCALE = 1/3
11·92" Rad.
22·66"
5·97"
Malby & Sons, Lith.

SHELL, B.L, OR Q.F. SHRAPNEL, 6 INCH, GUN OR HOWITZER.

MARK XIV.

SCALE = 1/3

Malby & Sons, Lith.

Drill Cartridges.

The drill cartridges are made up similarly in arrangement to the cartridges which they represent.

The core is made of wood covered with leather, and the rings of string bound with leather.

The rings are secured to the core by leather laces.

High Explosive Shell.

(*Plate XVII.*)

Mark II light shell is made of forged steel, the point being truncated and fitted with a gunmetal bush, which is tapped to the G.S. fuze-hole gauge. A large steel plate disc is screwed into the base of the shell, and a plain copper driving band fitted into a groove near the base of the shell, the groove having waved ribs to prevent the band turning.

Mark I light differs from Mark II in not having a steel plate disc.

Mark III heavy differs from the light shell in being longer, in having slightly thicker walls, and in having a broad vavasseur driving band.

Mark II differs only from the Mark III in the driving band groove having straight ribs with chisel cuts to prevent the band turning.

Mark I is similar to Mark II, except that the groove for the driving band is not undercut.

For further details *see* "Treatise on Ammunition."

Marks VIII and *XI* gun shell may also be used with the howitzer.

The Mark VIII has a tapered cavity and is fitted with a small steel plate disc, also a copper gascheck driving band. The Mark XI differs from the Mark VIII in having a larger steel plate disc.

Practice Projectiles.

These are iron shell, and are intended for practice purposes.

The head of the "heavy" shell is struck with a radius of two diameters, and in the case of the "light" with a radius of 1½ diameters.

The *Mark I light* shell has the same groove and pattern of driving band as that for the Mark II "light" high explosive shell.

The *Marks IV, III, and II shell* are of the same dimensions; they have the same pattern driving band as for the Mark III "heavy" lyddite.

The groove for the band, in the case of the Mark IV, has four waved ribs and three chisel cuts; that for the Mark III has five straight ribs. Mark II is similar to the Mark III, except that the groove is not undercut.

The *Mark I* shell is similar to the Mark II but has thinner walls.

Shrapnel Shell.

(*Plate XVIII.*)

The *Mark XIV* B.L. or Q.F. shell is made of steel, the head being forged separately and secured to the body of the shell by steel screws and twisting pins.

The head is fitted with a gunmetal bush screwed to the 2-inch fuze-hole gauge, with a set screw for securing the fuze. A wood block is fitted to the interior of the head.

The body of the shell is recessed in the base to take the tin cup containing the bursting charge, and also a steel disc on which the balls rest.

A metal tube fitting into the fuze-hole at one end, and screwed into the steel diaphragm at the other, conveys the flash from the fuze to the bursting charge.

The interior of the shell contains about 1,317 mixed metal bullets (35 per lb.) and resin.

An undercut groove is turned near the base of the shell to take a copper gascheck driving band, the groove having four waved ribs in it to prevent the band turning on the shell.

The *Mark XII* shell differs from the Mark XIV in having a G.S. fuze-hole socket, and in being fitted to take a primer. It contains about 436 bullets (14 per lb.).

Mark IX differs from Mark XII in having parallel walls, and in containing about 453 bullets.

The *Mark VIII* only differs from the Mark IX in the groove for driving band having five straight ribs, the latter having chisel cuts across them to prevent the band turning on the shell.

The *Marks V, V*, VI, VI* and VII* have thinner walls (0·55 inch), are 18·925 inches long, and contain 518 balls.

Marks VI, VI* and VII have the same driving band as that described for the Mark VIII, but in the Mark VI the groove for driving band is not undercut. Mark V has a driving band with the front slope of the band slightly grooved, and two undercut cannelures. Mark V* is a similar shell fitted with the band described for the Mark XIV.

The *Mark IV* has thinner walls (0·5 inch) and 536 balls, otherwise the same as Mark V.

The *Mark II* is 18·2 inches long and has walls 1·1 inches thick. It is filled with 255 balls and has a similar driving band to that described for the Mark V.

The *Mark I* light shell is fitted with a 2-inch fuze hole, and has a wood block down the centre of the shell. It contains about 905 mixed metal bullets (27 per lb.) and is not fitted to take a primer.

A plain copper band, similar to that for the Mark II "light" high explosive shell (Plate XVII), is fitted into an undercut groove having three waved ribs to prevent the band turning.

STAR SHELL.

(*Plate XIX.*)

The body of the shell is made of steel, and has a recess in the base for the reception of a bursting charge of 10 drams of R.F.G.[2] powder in a shalloon bag threaded with quick match. At a distance of ·67-inch from the base an undercut groove, for a copper driving band, is turned with four waved ribs. The band is of the same pattern as that described for the Mark III "heavy" high explosive shell.

Malby & Sons, Lith.

FUZE, PERCUSSION, DIRECT ACTION, WITH CAP, No. I, MARK II.

SCALE = 1/1

FUZE, PERCUSSION, DIRECT ACTION, WITH CAP, No. I, MARK III.

SCALE = 1/1

 Malby & Sons, Lith.

The head is fitted with a metal fuze-hole socket screwed to the general service fuze-hole gauge, and contains a wood block. The head is attached to the body of the shell by six brass screws and six twisting screws. The fuze socket fits into the end of a wrought iron central tube, which is in two pieces connected by a screwed gunmetal junction piece, containing a shalloon primer of 70 grains R.F.G.[2] powder, which is kept in position by a piece of copper wire passed through the central tube. The tube is pierced with fire holes (to admit the flash to the priming of the stars), and is screwed into a disc of wrought iron at the base of the shell.

The shell contains twelve stars in two tiers, six in a tier. Each tier is supported by a corrugated steel lining (in two parts) to prevent their being crushed. A perforated iron plate is placed between the two tiers.

Drill Shell.

The *Mark III* is of iron with the nose fitted with a gunmetal fuze-hole bush. Two grooves are turned on the body to receive gunmetal bands, to prevent injury to the rifling of the gun. The base of the shell is recessed, and a steel rod is fitted through holes in the side as a means of extraction.

The base of the shell is also turned and screwed to take a steel ring, which secures the steel rod. A groove is turned at the junction of the ring and shell to receive a grummet of 2-inch tarred rope, to prevent the shell being rammed too far. The shell will be weighted with sand.

The *Mark II* shell differs from the Mark III in the handle for extraction purposes being cast in one piece.

Fuze, Percussion, Direct Action, with Cap, No. 1, Marks I*, I**, II and III.

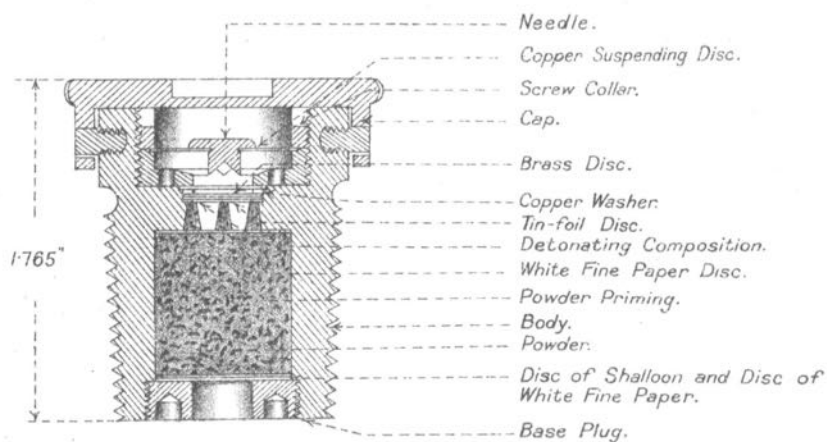
(*Plate XX.*)

Mark II.—This fuze is intended to act on direct impact; it cannot be depended on to act on graze unless fired at angles of elevation of ten degrees and upwards.

It is made of gunmetal, turned all over, and screwed below the head to the G.S. fuze-hole gauge. The interior is bored out at the lower end for the powder charge, and closed with a screw base plug. A recess in the upper part of the fuze is charged with detonating composition, and the holes communicating with the magazine are filled with powder priming. The fuze is fitted with a steel needle, passing through and secured in a copper suspending disc, ·032-inch thick. The lower part of the fuze is filled with 75 grains of pistol or R.F.G.[2] powder. A gunmetal cap, having a T-shaped slot cut out in each side to fit over the projecting pins in the head of the fuze, is secured over the top.

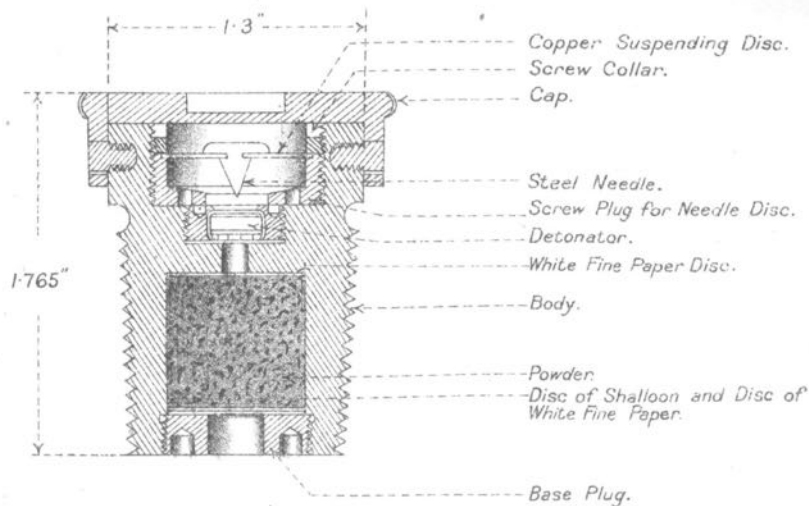
On striking any object the suspending disc is driven in and the needle is forced against the detonating composition, thereby exploding the fuze.

Mark III differs from Mark II in having a removable detonator, a single pointed needle, and a slightly smaller magazine, containing 65 grains of powder.

FUZE, PERCUSSION, DIRECT ACTION, WITH CAP, Nº I, MARK II.

SCALE = 1/1

FUZE, PERCUSSION, DIRECT ACTION, WITH CAP, Nº I, MARK III.

SCALE = 1/1

Malby & Sons, Lith.

Marks I* and I** fuzes may also be used.

Weight ... ... 6¾ ozs. (without cap).

These fuzes are issued, one in a tin cylinder, for this equipment.

FUZE, PERCUSSION, D.A., WITH CAP, No. 17, MARK III.

(*Plate XXI.*)

This fuze, which is made of gunmetal, is screwed externally below the head to the G.S. gauge.

The head has a pin on each side to engage the safety cap with which the fuze is furnished. It has also a square recess in the top to take either the Key No. 5 or No. 19, Mark I.

A safety pin passes through the safety cap and body, the lower end of the hole being closed with a brass screw plug.

The cap and safety pin are removed just prior to loading.

Weight, 9 ozs. 3 drs. (without caps).

The fuzes are packed one in a tin cylinder, 50 cylinders in a wood case.

FUZE, PERCUSSION, D.A., WITH CAP, No. 44, MARK II.

(*Plate XXII.*)

This fuze, which is made of gunmetal, is screwed externally below the head to fit the G.S. fuze-hole.

The head has a pin on each side to engage in slots in the side of the safety cap with which the fuze is furnished.

The safety cap has two projecting milled edges on the exterior, and two T shaped slots in the side to engage with the pins projecting from the head of the fuze. Two pins are screwed into the cap at right angles to the slots and engage with the slots in the head of the fuze. Five holes are drilled through the cap, four for the securing pins and a central one, in the bottom of the square recess for fixing key, to take the whipcord which attaches the safety pin to the cap.

The two securing pins are made of copper and consist of a loop with two legs, the pins being connected with each other by a length of twisted wire having an elongated loop at each end. One leg of each pin is split for the purpose of opening out after being passed through the side of the cap into the T shaped slot.

A strip of soft brass is soldered to the cap, one end being left free to turn down and secure the wire loop of the securing pins.

The securing pins, cap and safety pin are to be removed immediately prior to loading. Care should be taken in removing the securing pins to withdraw them by a straight pull in the direction of the length of the fuze. When not in shell, the fuzes are packed one in a cylinder, 50 in a case, wood, packing.

Weight ... ... 8 ozs. (without caps).

FUZE, TIME AND PERCUSSION, MIDDLE, No. 54, MARK III.

Mark III.—The body is hollow, and has a stem on its upper side. Round the base of the stem an annular groove is cut, from which a hole is bored to the side of the body, for the gas to escape through.

FUZE, PERCUSSION, D.A., WITH CAP, No 17, MARK III.

SCALE = 1/1

Safety Pin.

2·54″

3517.

Malby & Sons, Lith.

FUZE, PERCUSSION, D. A., WITH CAP, Nº 44, Mk II.

SCALE = 1/1.

9617.
Malby & Sons, Lith.

The sides of the body are pierced with three fire holes; the top of the body is screwed to receive a hexagonal cap. Between the cap and the dome fits a brass washer with feathers fitting into slots on the stem of the body; it is to prevent the dome from turning with the nut and altering the setting of the fuze when the cap is screwed tight.

The *percussion pellet* has a slot in the side for the safety pellet and brass ball to fall into, when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a charge of F.G. powder, and then the needle plug which is screwed in; the latter is perforated with six fire holes and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet to prevent the latter turning during flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet, and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball and is suspended in the body by a thin copper wire passing through it. A hole is also bored in the upper part of the pellet and body of fuze for the safety pin to pass through.

The *base plug* has a conical hole bored in it, and is closed at the bottom by a shalloon disc and brass washer spun in; it contains a perforated pellet of pressed powder, secured by a brass washer spun over on top. The plug is fixed by stabbing in three places.

The *composition ring* has an annular groove round it for the composition; a projection on the upper side contains the hammer with steel needle, suspended by a ·022-inch wire, and a detonator under it for lighting the composition in the ring. The hammer is also secured by a safety pin passing under it, the hole in the ring left by its withdrawal being closed by a brass pellet with a spiral spring above it. The ring is barrel shaped outside to facilitate the setting of the fuze, and is kept in position by three projections on the side, which fit closely round the stem of the body. Two holes are bored through the top of the ring at the commencement of the composition and covered with paper. The ring is graduated from 0 to 30, and reads as quarter units, and has an arrow head between the last graduation and the commencement to show the position of safety.

The body has an arrow head or black triangular mark on it for setting the fuze, opposite which is a hole from the surface to the percussion arrangement, filled with powder, for communicating the flash when the composition has burnt to it.

A small hole is made in the side to receive the pin in the semi-circular arm of the No. 5 fuze key when screwing the fuze into the shell.

The fuze is stamped T on the ring close to the "time" safety pin, and P on the body close to the "percussion" pin to distinguish them. The time safety pin has a scarlet loop. If the fuze is required to act as a percussion fuze only, the P pin should be withdrawn, if as a time fuze only, the T pin, and if as a time and percussion fuze, both pins.

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To set the time arrangement of the fuze, the nut is loosened with the No. 5 fuze key, and the ring moved round till the required graduation is opposite the arrow or black triangular mark on the body; the nut is then tightened, great care being taken to see that it is screwed down as tightly as possible.

The time of burning of the fuze at rest, when set at 30, or full length, is 16 seconds.

Action.—On discharge, if the "time" safety pin has been withdrawn, the hammer sets back, shearing the suspending wire, and fires the detonator, which lights the end of the ring of composition; this burns until the channel communicating with the lower part of the fuze is reached, when the flash passes down it and fires the detonator and magazine in the percussion arrangement.

If the "percussion" pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug in the shell.

Weight ... ... 1-lb. 4-ozs.

Fuzes which have been fitted with 0·35 grain detonators will have a star added to their numeral.

No. 54 fuze will be superseded by No. 62 when existing stock is used up.

†Fuze, Time and Percussion, No. 62.

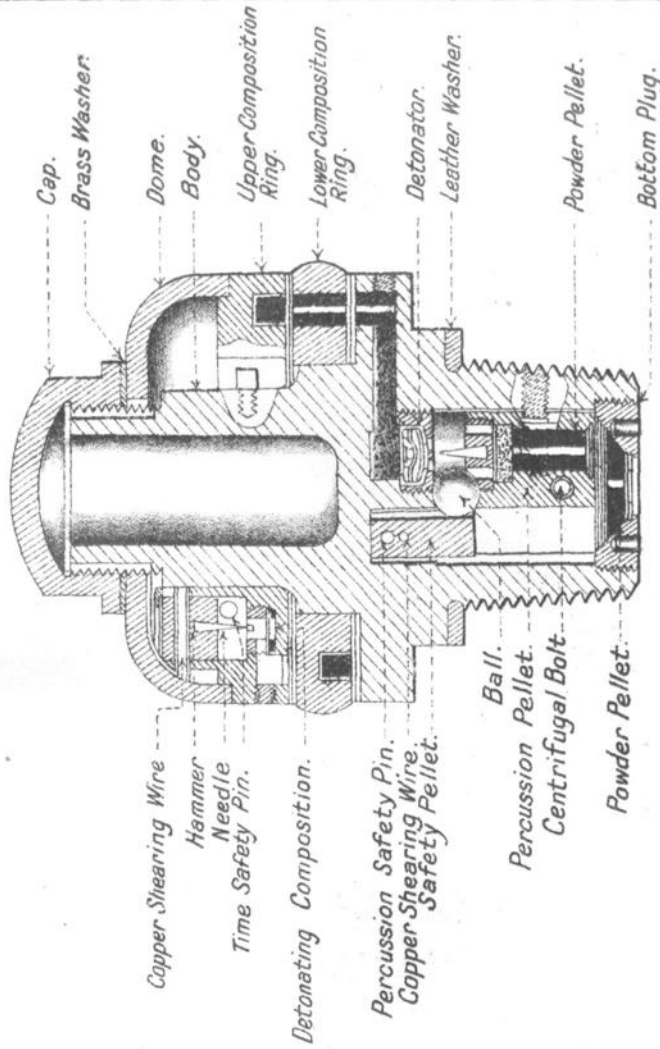
(*Plate XXIII.*)

The Mark II fuze principally consists of the following parts, which are made of gunmetal, except where otherwise stated:—Body, detonator plug with detonator, percussion pellet with needle plug and steel needle, brass safety pellet, centrifugal bolt, brass ball, base plug, time composition rings (upper and lower), 2 closing pellets, brass springs, dome, brass washer, cap, two safety pins, and leather washer.

The *body* is screwed at the lower end to G.S. fuze-hole gauge, and bored from the bottom to receive the percussion pellet and base plug. Two holes are bored beyond the recess for the percussion pellet, one for the detonator plug, the other for the safety pellet. The hole bored for the detonator plug is continued horizontally to form a small magazine, which is filled with fine grain powder; the hole then leads upwards to connect with the lower time ring, and contains a perforated powder pellet. The stem of the body is fitted with two studs to engage corresponding slots in the upper ring, to prevent it revolving, and is screwed to take the cap, two featherways being cut in top end of stem, to receive corresponding feathers on the brass washer over dome. A small tablet of fine white paper is secured with shellac to the body of the fuze, over the perforated powder pellet, and over this tablet are two washers, one of fine white paper, and the other of cloth, which are secured with shellac, a hole being cut through the washers and tablet, immediately over the powder pellet; similar tablet, pellet and washers exist on top of the lower time ring.

† This fuze is only suitable for use in the Mark I* howitzer with the 2-lb. 8½-oz. and 2-lb. 5-oz. charges.

FUZE, TIME AND PERCUSSION, No. 62, MARK II.

SCALE = 1/1

Copper Shearing Wire
Hammer
Needle
Time Safety Pin.
Detonating Composition.
Percussion Safety Pin.
Copper Shearing Wire.
Safety Pellet.
Ball.
Percussion Pellet.
Centrifugal Bolt.
Powder Pellet.

Cap.
Brass Washer.
Dome.
Body.
Upper Composition Ring.
Lower Composition Ring.
Detonator.
Leather Washer.
Powder Pellet.
Bottom Plug.

T 60 50 52 50 48 46 44 42

P

3·25″

ELEVATION.

SECTION.

3517.
Malby & Sons, Lith.

The *detonator plug* is screwed on the outside to fit the hole prepared for it, and contains a detonator, which consists of a copper cap with fire holes filled with $3\frac{1}{2}$ grains of detonating composition. with a ·005 brass disc under the composition, and a tinfoil disc over it, to prevent the composition working through the holes.

The *percussion pellet* has a slot in the side for the safety pellet and brass ball to fall into when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a perforated powder pellet ($5\frac{1}{2}$ grains), having under the latter a muslin disc and brass washer, and over it one grain of fine grain powder, and then the needle plug, which is screwed in; the latter is perforated with six fire holes, and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet, to prevent the latter turning in flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet, and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball, and is suspended in the body by a thin copper wire, which passes through it. A hole is also bored in the body and upper part of pellet for the percussion safety pin; the hole in the body left by the removal of the safety pin is closed by a brass pellet, having above it a spiral spring in compression.

The *base plug* contains a perforated powder pellet; over the latter are two discs, one paper, the other muslin, and a brass washer, and under the pellet a shalloon disc and a brass washer. The base of the fuze is closed by the plug, which is made secure by being stabbed in three places.

The *composition rings* have each a channel, which is lined with asbestos paper, for the fuze composition, and a hole is provided which allows the gas direct escape outside; this escape hole is lightly closed by means of a brass disc covered without by Pettman's cement.

The upper ring has a chamber which contains a hammer with steel needle; the hammer is suspended by a ·022-inch copper wire, and a safety pin passes through the ring and under the hammer; the hole in the ring, left by the withdrawal of the pin, is closed by a pellet of brass, as mentioned above for the percussion safety pin (*see* safety pellet). Under the needle is detonating composition and mealed powder. The composition channel on the under side and the chamber are connected by a lighting hole, the composition being roughened at the lighting point to assist ignition. The outside of the ring is graduated from 0 to 60, each division being subdivided into halves and quarters, with an arrow point on bridge portion to mark the position of safety, *i.e.*, when the arrow and pointer are in the same vertical plane. The interior of the ring has two slots, which engage studs on the stem to prevent the ring revolving.

The lower ring has a composition channel similar to the upper ring. The outside of the ring is barrel shaped and *milled* to facilitate setting, and fitted with a setting pointer of cupro nickel.

The *dome, brass washer* and *hexagonal cap* are put on the fuze in the order here given.

The dome is of sheet brass stamped into shape, and covers the time lighting arrangement.

The washer has two feathers, which engage in featherways cut in the stem of fuze; its object is to prevent the dome from turning and altering the setting of the fuze through friction when screwing down the cap.

The cap must be clamped tightly; this is most important. If not done, the composition may explode instead of burning. Care must also be taken when clamping not to alter the setting.

The fuze is stamped T on the upper composition ring close to the time safety pin, and P on the body close to the percussion safety pin. The pins are each provided with a whipcord becket or loop, the T one being scarlet and that of P tarred.

The openings in the fuze are coated with Pettman's cement to exclude damp.

A leather washer in a groove above the fuze-hole thread makes a tight joint.

The fuze should be set *before* the safety pins are withdrawn.

To set the time arrangement the cap is loosened with the No. 5 fuze key, and the ring moved round until the graduation ordered and the pointer coincide; the fuze is then clamped by screwing down the cap as tightly as possible, care being taken that the ring and dome have even bearings and the setting has not shifted.

If the fuze is required to act as a percussion fuze only the P pin should be withdrawn and the T pin left in position; otherwise both pins should be withdrawn, but this should not be done till the moment of loading.

Action.—On discharge, if the "time" safety pin has been withdrawn, the hammer sets back, shearing the suspending wire and igniting the detonator and the composition in the upper time ring, which burns until it reaches the position indicated by the setting pointer. The flash then passes through a hole in the lower ring to the composition in its under surface, and burns back in the opposite direction until it reaches a hole in the body (which is directly under the zero point of the upper ring), where it flashes down through the radial magazine, percussion detonator and pellet, and base plug into the shell.

If the "percussion" pin has been withdrawn the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn; the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug into the shell.

The time of burning at rest is about 35 seconds.

Weight of Mark II fuze (about) 1 lb. 9¾ ozs.

Mark I fuze differs from the Mark II principally in the following particulars:—

(1) The dome is thinner.
(2) The stem of the body is thinner and slightly shorter.

5617.
Malby & Sons, Lith.

(3) It has two setting pointers, one of which is fixed to the lower time ring and the other to the body under the rings.
(4) The upper time ring is barrel shaped on the outside to facilitate setting, and is graduated from 0 to 30.
(5) The lower time ring is flat on the outside, and graduated from 30 to 60.
(6) The fuze is slightly lighter, the average weight being 1 lb. 7 ozs.

Fuze, Time and Percussion, No. 82.

(*Plate XXIV.*)

The *Mark III* fuze consists of the following parts, which are made of aluminium, except where otherwise stated:—Body, metal time composition rings (top and bottom), brass time detonator pellet and three retaining bolts with springs, two needle plugs, brass percussion detonator pellet and three retaining bolts with springs, metal base plug, brass spring, brass safety pellet, brass cap, two safety pins, and cloth washers.

The *body* is screwed externally at the lower end to the 2-inch fuze-hole gauge, and is recessed to receive the percussion detonator pellet with spring, and base plug; a needle plug is screwed into the end of this recess. Three retaining bolts with springs are fitted into the sides of the percussion pellet and body at right angles to the axis of the fuze.

A cloth washer covers the top surface of the flange of body. A brass-lined channel filled with fine grain powder leads from the powder pellet to the base plug.

The stem of the body, which is screwed at the top to take the cap, has four brass-lined holes, at right angles to the axis of the fuze, for the time detonator pellet and three retaining bolts with springs. A hole is bored, parallel with the axis of the fuze, for the safety pellet.

The circumference of the body is graduated from 0 to 40, a red + indicating the safety point. A slot is also provided to take the "Key, No. 19" for fixing or removing the fuze.

The *top composition ring* has four recesses to correspond with the holes for detonator pellet and retaining bolts in the stem, a needle pellet being screwed into the end of the one for the detonator pellet. A hole is bored from the needle recess to the composition channel and contains a perforated powder pellet. A gas escape hole is provided at the commencement of the composition, and is closed with a brass disc. The ring is pinned to the stem to prevent it turning.

The bottom composition ring is movable, and is provided with a slot to take the "Key, No. 36."

A hole through the ring at the commencement of the composition contains a perforated powder pellet to communicate with the top ring. The upper surface of the ring is covered with a cloth washer.

A gas escape hole is provided at the commencement of the composition, and is closed with a brass disc.

The *time detonator pellet* contains a detonator consisting of ·75 grain of detonating composition, and a ·87 grain powder pellet.

The pellet is engaged by the right and left retaining bolts, which are held together by the third retaining bolt, the latter being fixed by the safety pellet and safety pin.

The *percussion detonator pellet* is bored to receive a 3-grain detonator and a perforated powder pellet. It has three recesses corresponding with the holes for the retaining bolts in the body, and is keyed to the body to prevent it turning. A brass cap with a central hole and a shalloon disc covers the recess containing the pellet.

The *spiral spring* is to prevent creep action.

The *base plug* contains fine grain powder, a hole in the centre being closed with a muslin disc.

The *safety pellet* retains the time pellet retaining bolt until the shock of discharge, and is suspended in the body by a copper shearing wire and safety pin.

The *cap* is screwed to the stem of body, it has two slots for the reception of a key, and is fixed with a steel set screw.

The fuze is stamped T on the top composition ring close to the time safety pin, and P on the body close to the percussion safety pin. The pins are each provided with a whipcord becket or loop, the T one being scarlet and the P one tarred.

The time of burning is about 40 seconds.

Weight, 1 lb. 2 ozs. 10 drs.

To set the time arrangement, the bottom ring is moved round with the "Key, No. 36," until the graduation ordered, and the setting mark, coincide.

If the fuze is required to act as a percussion fuze only, the P-pin only should be removed, otherwise both pins should be removed. This, however, should not be done until the moment of loading.

The fuzes are packed one in a tin cylinder, 25 cylinders in a wood case.

The *Mark II* fuze differs from the Mark III in having no brass lining to the flash holes in body and in the base plug and cap, being of aluminium instead of brass.

The *Mark I* fuze differs from the Mark II in the holes for the detonator and powder pellet in the percussion pellet being bored eccentrically instead of centrally, the needle plug being also arranged to suit in the body of the fuze.

Action of Fuze—Time arrangement.—On shock of discharge, the safety pellet sets back shearing the suspending wire, and releases one of the retaining bolts. The centrifugal motion of the shell now causes the retaining bolts and the time detonator pellet to fly outward, and the latter coming into contact with the needle plug fires the detonator.

The flash passes to the composition in the underside of the top ring and burns until it reaches the hole in the bottom ring, the composition of which burns back in the opposite direction until it reaches the hole in the body where it flashes down to the base plug and into the shell.

• *Percussion Arrangement.*—The centrifugal motion of the shell causes the retaining bolts of the percussion pellet to fly outward, leaving the percussion pellet free to move forward on impact or graze, on to the needle plug, firing the detonator, the flash then passing to the base plug and into the shell.

FUZE, TIME, 15 SECONDS, NO. 25.

(*Plate XXV.*)

The *Mark IV* fuze is made of aluminium and consists of the following principal parts, viz., body, time ring, cap, safety pin, detonator pellet with detonator, stirrup spring, needle plug, magazine, base plug and leather washer.

The lower portion of the *body* contains the magazine, and the upper portion forms a stem and contains the detonator pellet with detonator and the needle plug. The shoulder of the body has a black mark to coincide with an arrow on the time ring, when set at safety.

The *time ring*, which is graduated from 0 to 44, is fitted round the exterior of the stem.

The *cap* fits over the time ring on top of a steel spring washer, and closes the head of the fuze; it is secured when in position by a steel keep screw.

A *safety pin*, provided with a loop of red cord, passes through the detonator pellet and the cap.

The *detonator pellet* is suspended by the safety pin and a stirrup spring, which is kept in position by its two clips.

The *magazine* contains 45 grains of R.F.G.[2] powder, and is closed by means of the bottom plug.

The openings of the fuze are waterproofed to exclude damp.

Action of fuze.—On shock of discharge the detonator pellet sets back, thereby straightening the clips of the stirrup spring, and being driven on to the needle of the needle plug, ignites the detonator which fires the composition of the time ring, this burning till it reaches the magazine channel, thereby igniting the powder in the magazine.

Approximate weight ... ... $5\frac{3}{4}$ ozs.

Mark III fuzes differ from the Mark IV in the bottom of the composition groove in the time ring being rounded instead of square, and in the groove having no asbestos lining.

The *Mark II* fuzes differ from Mark III in not being waterproofed.

Mark I fuzes differ from Mark II as follows:—

(1) The underside of the time ring is flat (instead of being provided with a lip and recess).
(2) The magazine channel is placed at a different angle.
(3) The aperture in the bottom plug is smaller.
(4) The external contour of the fuze is slightly different.

Adapter, 2-inch Fuze Hole, Mark I.

This adapter is screwed into the shell with 2-inch fuze holes when fuzes T and P, Nos. 54 and 62, are used. It is made of aluminium and is screwed externally below the shoulder to suit the 2-inch fuze hole and is screwed internally to the G.S. gauge. A slot is cut in the shoulder to take the No. 16 adapter key, for fixing or removing, and a steel set screw for fixing the fuze is inserted in a hole bored and screwed in the shoulder.

Fuzes, Drill.

The drill fuzes resemble, generally, the service fuzes which they represent, and in some cases burnt-out service time and percussion fuzes are used for this purpose, steel instead of copper safety pins being fitted.

To facilitate identification, the drill fuzes are stamped "Drill" and blackened.

Adapter, Drill, 2-inch Fuze Hole; Mark I.

The drill adapter is similar to the service one, but is made of brass or other hard metal, blackened externally and stamped "Drill."

TUBES.

Tubes, Friction, T Marks I to IV*.

(Plate XXVI.)

Mark IV.—The form and general dimensions of the tube are shown on Plate XXIV. It consists of the following principal parts:— Body, head, copper ball, plug and friction wire.

The head is of gunmetal, the body of solid drawn brass, the ball of soft copper, and the friction bar of half round copper wire, twisted into a round bar, with a loop at one end and the other roughened. A hole in the side of the head of the tube over the friction wire is charged with about 2 grains of detonating composition, in the form of a paste, laid over the roughened part of the friction wire, the hole being closed with a screwed brass plug. The body is charged with 8 grains of pistol powder, and is closed with a cork plug, covered with shellac cement, and a paper disc. The end of the body is burred to secure the cork plug.

A brass pin is inserted to prevent the body becoming unscrewed. The upper part of the body has a central perforation, which is enlarged in its lower part into a conical recess. The copper ball is placed in this recess, and is retained therein by a screwed plug, pierced by three fire holes.

On the withdrawal of the friction bar the detonating composition is ignited, and the flash, passing down the perforation in the head and through the plug, fires the powder charge. The ball is driven back by the explosion and seals the tube. This, together with the mode in which the tube is held in the special vent employed with it, prevents the escape of gas.

3517
Malby & Sons, Lith.

The body is lacquered inside and outside.

*Mark IV** is a fired Mark IV tube fitted with a new shank (or body), and filled, and having the head re-fitted with a new friction wire. The earlier Marks of T tubes differ only in minor details from Mark IV.

Marks I, I*, II and II* will be used up with blank ammunition.

Total length of tubes, 1·9-inches.

The tubes are issued in square tin boxes, 10 in a box. Both the top and the bottom of the box are removable, being secured by soldered bands, and the tubes are so arranged that five may be withdrawn from the top and five from the bottom.

†Tube, Friction, T, for blank, Mark I.
Adapter.
Tube, Copper.
(*Plate XXVII.*)

The tube is made of solid drawn copper, 1·89 inches long, with a solid head. It is filled with pistol powder, and the bottom is closed by a paper disc, over which is a cork plug secured by shellac.

The nib piece is solid drawn and projects right through the tube; it is secured by solder, and has a small hole bored in it to allow the flash from the detonating composition to reach the powder in the tube.

The nib piece contains a copper friction bar, roughened, and smeared with detonating composition; the composition is damped with shellac varnish while it is being smeared on. The nib piece is flattened so as to retain the friction bar, the projecting portion of which is formed into a vertical eye, into which the hook of the lanyard fits.

The adapter consists of the head of a used T friction tube, formed to receive the above mentioned tube, and fitted with a removable stem.

For firing, a tube is inserted into the adapter and the lanyard hooked into the eye. On pulling the lanyard the friction bar is drawn out, igniting the composition and firing the tube.

The adapter can be used for several rounds, tubes being inserted as refills, as required.

Notes.

In the event of a tube failing to ignite a charge, care should be taken in extracting the fired tube not to stand directly in rear of the howitzer, as the gas generated will cause the tube to fly out with some violence so soon as the T head is clear of the recess in the vent.

The vent channel sometimes becomes choked with residue from the cartridge. When this occurs, the taper portion should be cleared with a "Rimer, vent, T," sufficiently to allow of the insertion of a tube, which, when fired, will remove the rest of the obstruction.

A tube is not to be inserted in the vent till the breech is properly closed.

† Not to be used until T tubes, Marks I, I*, II, and II* are used up.

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TUBE, FRICTION, T, DRILL, MARK I.

The drill tube is made of hardened steel, of the same external shape as the service tube. The head of the tube is grooved to receive a hardened steel spring, which is arranged for a pull of about 50-lbs.

TUBE, FRICTION, T DRILL, CONVERTED, MARKS I AND II.
(*Plate XXVIII.*)

These are fired service T tubes fitted with a steel spring clip, which is adjusted for a pull equal to that required for the service tube

These tubes will supersede the "Tube, friction, T, drill, Mark I" when existing stock is used up.

MISCELLANEOUS STORES.

IMPLEMENTS, AMMUNITION—
KEY NO. 5—G.S. FUZE-HOLE FUZES.

This key is made of steel. It is shaped at one end and fitted with nibs to engage in the recess in the body of time and percussion Nos. 54 and 62 fuzes for fixing purposes; it also has a hexagonal hole formed in the body for adjusting the nuts of Nos. 54 and 62 fuzes for setting purposes.

A projection is provided to suit the square recess in the cap of the Nos. 1, 17 and 44, for fixing purposes and for the removing of plugs.

A white cotton lanyard is attached to the key.

IMPLEMENTS, AMMUNITION—KEY NO. 13—NO. 25 FUZE.

This key is made of steel, one end being annular with a nib piece to fit in the slot provided in the body of the fuze for fixing purposes. The other end is shaped and fitted with a projection to suit the slot in the time ring for setting purposes.

IMPLEMENTS, AMMUNITION—KEY NO. 16—MARK II.

The *Mark II* key consists of a bar of steel with a projection to suit the slot in the adapter 2-inch fuze-hole for fixing and removing the latter.

The key has a 27-inch white line loop.

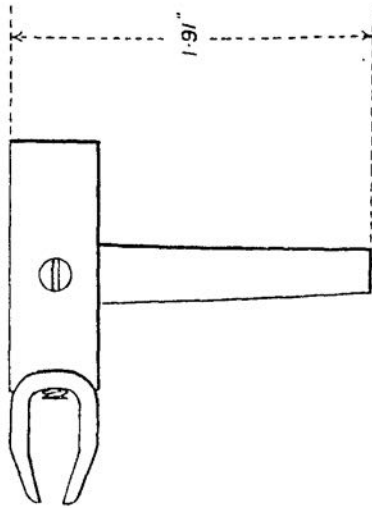
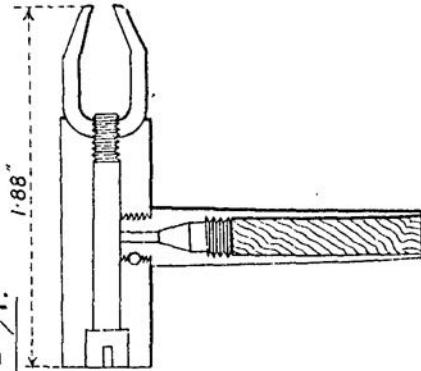
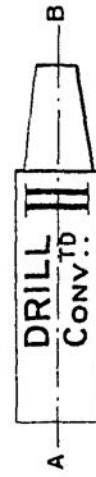
The *Mark I* key differs from the Mark II in being wider at the end having the projection and in being shaped to suit the shoulder of the adapter.

IMPLEMENTS, AMMUNITION—
KEY, NO. 19 (MARK I)—FIXING NOS. 17 AND 82 FUZES.
KEY, NO. 19 (MARK II)—FIXING NO. 82 FUZE.
KEY, NO. 19 (MARK III)—FIXING NO. 82 FUZE.

The *Mark I* key is made of steel, the ends being shaped and provided with projections to suit the flange on the body of the No. 82 time and percussion fuze, one end being used for inserting and the other for removing the fuze from the shell. The ends are marked accordingly.

TUBE, FRICTION, T, DRILL, CONVERTED, MARK II

SCALE = 1/1.

Malby & Sons, Lith.

A screwdriver is formed at one end for the fixing screw of the shell and a projection at the other end to fit the setting hole in the lower time ring of the fuze. It has also a projection on the centre of the body to fit the square hole in the cap of the No. 17 fuze for fixing purposes.

The key is fitted with a white cotton lanyard.

The *Mark II* key differs from the Mark I in not having the screwdriver nor the projection for fixing the No. 17 fuze.

Marks I and II keys will, however, no longer be used for setting No. 82 fuze, the No. 36 key being used instead.

The *Mark III* key differs from the Mark II in not having the stud for setting the No. 82 fuze.

IMPLEMENTS, AMMUNITION—KEY No. 23.

This key is made of steel, T shaped, for use with plugs G.S. or plugs 2-inch. It is also suitable for fixing D.A. percussion fuzes.

IMPLEMENTS, AMMUNITION—KEY No. 36.

PUBLIC LIBRARY OF VICTORIA

This key is made of steel, and has a semicircular end shaped to suit the bottom ring of the No. 82 fuze and to show the setting mark, and having a projection in the centre of the semicircular portion to suit the slot in the ring of the fuze for setting purposes. It is fitted with a 30-inch white cotton line loop.

INDICATOR, CHARGE AND ELEVATION (RULE, RANGE), B.L. 6-INCH 30-CWT. HOWITZER, MARK I*.

The indicator is made of boxwood on the slide rule principle, and is arranged so that the elevation in degrees for any range can be ascertained with all charges.

Holding the indicator so that the slide is drawn out towards the left, the upper side is furnished with a logarithmic range scale graduated to read from 600 to 7,500 yards. The corresponding upper side of the slide is provided with a degree scale from 2° to 35° marked "Elevation in degrees." Dots marked 10°, 20°, 30°, and 40°, with the words "Angle of descent" are also marked on the slide towards the right side, and an indicating arrow is marked on the lower edge under the 20° dot for use with a scale of charges from 1 to 7, which is marked on the underside of the indicator.

When the indicating arrow on the slide is brought opposite the line and figure representing the charge, the elevation in degrees for any range with that charge can then be read off the upper side of the slide opposite the range shown on the upper scale on the indicator.

To find a suitable charge for a given range and angle of descent, place the dot of the given angle in line with the given range, and the arrow on the slide will indicate the charge to be used.

Dimensions.

Length	6·9 inches.
Width	2·1 inches.

LIST OF STORES.

The stores to be carried will vary slightly, according to whether the equipment is for Siege Artillery, Movable Armament, or Territorial Artillery, *vide* Equipment Regulations.

Carriage.

Articles.	No.	Where Carried.
Box, T-tubes	1 (*a*)	Right side on trail.
Bit, vent, 14-inch	1	Inside trail, right side. In action only.
Brush, piasaba	1	Under carriage.
Can, lubricating, No. 9 (for Rangoon oil)	1	In trail.
Case, No. 1 dial sight	1 (*b*)	Right side on trail.
Covers, breech	1	As convenient, when not on howitzer.
Covers, muzzle, No. 5	1	
Hammer, claw, 28-oz.	1	Right side on trail.
Handspikes, common, 6-ft. ...	5	4 under carriage, and 1 on right side of trail.
Lever, jamming handwheel, elevating (Mark I* carriages only)	1	Left side on trail.
Lever, pointed, No. 2	1	Left side on trail.
Lever, pump	1 (*a*)	Top of cradle, left side.
Oil, Rangoon ... ... pints	½	In No. 9 can.
Pincers, carpenters' ... pairs	1	Right side on trail.
Post, picket, 5-ft. or 6-ft. ...	1	Under carriage.
Posts, aiming	2	On left tensile rod.
Rammer	1	Under carriage.
Rimer, vent, T	1	Inside trail, right side. In action only.
Rope, check, No. 1 or 2	1	In trail.
Sight, dial, No. 1	1 (*b*)	In case.
Socket, No. 1 dial, sight	1 (*b*)	In bracket dial sight.
Spanner, McMahon, 15-in. (or adjustable)	1	Right side on trail.
Spanner, No. 182 (elevating gear, Mark I carriages only)... ...	1	Left side on trail.
Stave, end, No. 17	1	Under carriage.
Tray, loading	1	On trail.

(*a*) Component of carriage. (*b*) Movable armament only.

Limber.

Articles.	No.	Where Carried.
Axe, felling, curved helve ...	1	Under footboard.
Axe, pick, 4½-lbs. (with helve)	1	Under limber.
Blocks, wood, brake, left ...	1	On platform board, off side.
Blocks, wood, brake, right ...	1	" " "
Box, No. 4 dial, sight ...	1 (*a*)	Back of limber box, near side.
Box, grease, 3-lb.	1 (*e*)	On axletree.
Box, lamp, siege	1 (*b*)	Back of limber box, off side.
Box, lantern, bull's-eye ...	1 (*c*)	" " "
Brush, water, carriage	1	Under platform board, near side.
Buckets, water, G.S.	2	Rear of limber.
Case, saw, hand	1	On limber box.
Connector, engine draught, No. 1	1 (*d*)	Under limber.
Covers, short rifle...	2 (*f*)	On rifles, front of limber box.
Cover, waterproof, 20 ft. by 10 ft.	1	On footboard.
Grease, lubricating ... lbs.	3	In box.
Hook, bill	1	Under platform board, off side.
Jack, lifting screw, No. 1 ...	1	On footboard, secured by lashing 1 in. 10 ft.
Key, lock	1	In pocket.
Kettles, camp	2	Under platform board.
Lamps, siege	4 (*b*)	In box.
Lantern, bull's-eye	1 (*c*)	"
Lever, compressing springs, No. 5	1	On platform board.
Maul, G.S.	1	Under limber.
Ropes, drag, heavy ... pairs	1	On footboard.
Saw, hand, 26-in.	1	In case.
Shovels or spades	4	Under near and off sides.
Sight, dial, No. 4	1 (*a*)	In box.
Swingletrees, No. 1	3	1 on platform board, 1 under near side, and 1 under off side.
Telescope, sighting, No. 2 ...	1 (*a*)	In box, No. 4, dial sight.
Washers, drag, 1st class, "B"...	1	Under platform board, near.
Washers, loop, 2nd class, "C"...	1	" " off.

(*a*) Siege Artillery and Territorial Force.
(*b*) Siege Artillery.
(*c*) Movable Armament and Territorial Force.
(*d*) No. 2 connector will eventually supersede the No. 1, but cannot be carried on the limber.
(*e*) Component of limber.
(*f*) Territorial Force only.

Box, Limber.

Articles.	No.	Where Carried.
Bit, vent, 14-in.	1	Lower tray.
Box, obturating pads and discs	1	In compartment.
Box, tube, friction, T	1 (*b*)	" "
Box, tallow	1	Bottom of box.
Brush, breech screw	1	Bottom of box, on top of spanners.
Can, lubricating, No. 5 (for olive oil)	1 (*b*)	In compartment.

(*b*) Component of limber.

Box, Limber—continued.

Articles.	No.	Where Carried.
Case, large, clinometer	1	In compartment.
Chalk, prepared ... ... box	1	Lower tray.
Clamps, tangent, sight "B" ...	2	"
Clinometer, large	1	In compartment.
Cloths, sponge	10	" "
Cordage, tarred, spun yarn, hemp, 3-thread ... ... lbs.	2	Bottom of box.
Discs, { pad, adjusting (spare and components) ...	4	In obturating pad box.
Discs, { obturating, protecting sets	3	" "
Dubbing (in tin box) ... lb.	1	Bottom of box.
File, second cut, half-round, 8-in.	1	Lower tray.
Handle, file, small	1	"
Implements, Ammunition—		
Key, No. 5—G.S. fuze-hole fuzes	2	"
" " 13—No. 25 fuze ...	1	"
" " 16—Adapter	2	"
" " 19—Fixing No. 82 fuze	2	"
" " 23—Plugs & D.A. fuzes	2	"
" " 36—Setting No. 82 fuze	2	"
Keys, { pump, seating	1	Bottom of box.
Keys, { case, powder, metal lined	1	Lower tray.
Knife, clasp	1	"
Lanyards, firing, No. 6, Marks II or III	2	In compartment.
Lever, lengthening spanners, No. 4	1	Bottom of box.
Line, { Hambro'	1	" "
Line, { white, 1-lb. skeins ...	1	" "
Measure, filling, hydraulic buffer, No. 1	1	" "
Oil, olive ... ... pints	1½	In No. 5 oil can.
Pads, obturating	3	In obturating pad box.
Packing, greased, ⅜-in. sq. { length of 66-in. l'gths.	1 (a)(d)	Bottom of box.
Packing, greased, ⅜-in. sq. { length of 44-in. "	2 (a)	" "
Pins, axis, link, actuating collar	3 (e)	Lower tray.
Pins, { keep, hinge bolt, cam lever	2	"
Pins, { linch, { 1st class ...	1	In compartment under tube box.
Pins, { linch, { 2nd class ...	1	" " "
Plates, preserving, bracket, fore sight	2	Lower tray. (When not on howitzer.)
Pliers, side cutting, 7-in.... pairs	1	Lower tray.
Plugs, { filling hole { anchoring buffer	1	"
Plugs, { filling hole { cradle buffers ...	1	"
Plugs, { tube, protecting, piston tail rod	1	Wrapped in sponge cloths at bottom of box.
Rope, cotton, white, 2-in., { length of 66-in. l'gths.	1 (c)(d)	Bottom of box.
Rope, cotton, white, 2-in., { length of 44-in. "	2 (c)	" "

(*a*) When the buffer is filled with "fluid lifts and jacks."
(*c*) When the buffer is filled with mineral oil.
(*d*) For anchoring buffer.
(*e*) Per section.

Box, Limber—continued.

Articles.	No.	Where Carried.
Rimers, vent, T	2	Lid of box.
Screw-drivers, G.S., 6-in. ...	1	Lower tray.
Screw-drivers, 2⅛-in.	1	"
Screws, lubricating, hole, $\frac{5}{16}$-in. by ⅜-in., boss-head	1	"
Screws, lubricating, hole, $\frac{5}{16}$-in. by ⅜-in., thumb ...	2	"
Screws, stop, actuating collar ...	3 (e)	"
Sights, B.L., crossbar, fore, left ...	1	Upper tray.
Sights, B.L., crossbar, fore, right ...	1	"
Sights, B.L., crossbar, tangent	2	"
Spanners, No. 180	1	Bottom of box.
Spanners, No. 181	1	In compartment.
Spanners, No. 193	1	Bottom of box.
Spanners, No. 265	1	" "
Spanners, hydraulic buffer, No. 80	1	" "
Spanners, hydraulic buffer, No. 81	1	Lower tray.
Spanners, hydraulic buffer, No. 82	1	"
Spanners, hydraulic buffer, No. 83	1	Bottom of box
Spanners, hydraulic buffer, No. 84	1	" "
Spanners, hydraulic buffer, No. 86	1	" "
Spanners, hydraulic buffer, No. 87	1	" "
Springs, catch, cam lever ...	1	Lower tray.
Springs, clip, carrier ring ...	1	"
Springs, latch, carrier ring ...	1	"
Tape, measuring, 100-ft.	1	"
Tallow, Russian ... ... lbs.	1½	In tallow box.
Ties, linch pin	4	With linch pins.
Tubes, friction, T	50	In tube box.
Tube, friction, T drill	1	Lower tray.
Twine, whipping ... ... lb.	¼	Bottom of box.
Vent, T, axial	1	In compartment.
Washers, packing, leather, anchoring buffer	2	Lower tray.
Wrench, breech mechanism, No. 50	1	In compartment.

Box, Store.

Articles.	No.	
Bolt, stop	1	
Collars, actuating, T tube ...	2	
Lever, cam, with bolt and pin ...	1	
Links, actuating, collar	2	
Ring, carrier	1	
Screw, breech	1	
Springs, catch, cam lever ...	4	
Springs, clip, carrier ring ...	4	
Springs, latch, carrier ring ...	4	
Wrenches, breech mechanism, No. 50	2	

(e) Per section.

DIAGRAM OF PACKING. A.

LIMBER.

Footboard :—Lifting jack, No. 1; Cover, waterproof; Pair heavy drag ropes.
Platform board :—Lever, compressing springs; Swingletree; 2 brake blocks.
Camp kettle, *under*. Camp kettle, *under*.
Drag washers, 1st class, *under*. Billhook, *under*.
Maul, *under*. Felling axe, *under*. Loop washer, 2nd class, *under*.
No. 1 Connector, engine draught, *under*.
2 Rifles in covers, strapped to front of box.

DIAGRAM OF PACKING. B.

DETAILED CONTENTS OF LIMBER BOX.

LID.

1 Rimer, vent, T.

1 Rimer, vent, T (spare).

LIMBER BOX.

1 Brush, breech screw.
1 Spanner, hydraulic buffer, No. 84.
1 Spanner, No. 193.
1 Spanner, hydraulic buffer, No. 83.
1 Spanner, hydraulic buffer, No. 80.
1 Lever, lengthening spanners, No. 4.
1 Spanner, hydraulic buffer, No. 86.
Cordage, tarred, spun yarn, hemp, lbs., 2.
Packing, greased, ½ in. square,
or
Rope, cotton, white, 2-in.
Measure, hydraulic buffer, 1.
Twine, whipping, ¼ lb.
Hambro' line, 1.
Line, white, 1-lb. skein.
Tallow, Russian, 1½ lbs., in box.
1 Spanner, hydraulic buffer, No. 87.
1 Key, pump seating.
Dubbing, 1 lb. (in box).
1 Spanner, No. 265.
1 Spanner, No. 180.

2 Lanyards, firing, No. 6,
Sponge cloths, 10.
1 Plug, tube, protecting tail rod.

1 Vent, T, axial, in tray.

Tubes, friction T, 50 in box.
1 linch pin, 1st class.
1 linch pin, 2nd class.
Ties, linch pin, 4.

1 spanner, No. 181.

Pads, obturating, Discs, adjusting, Discs, protecting } in box.

Oil can, No. 5 (for olive oil).

1 Wrench, breech mechanism, No. 50.

Clinometer, large, in case.

LOWER TRAY.

3 Pins, axis, link, actuating collar.
1 Bit vent.
1 pair Pliers, side cutting.
1 File, half-round, and handle.
1 Spanner, hydraulic buffer, No. 82.
3 Lubricating screws.
1 Spanner, hydraulic buffer, No. 81.
3 Screws, stop, collar actuating.

1 Screwdriver, 6-in.
2 Key, No. 16.
1 Screwdriver, 2⅛-ins.
1 Key, No. 13.
2 Keys, No. 19.
2 Keys, No. 23.
2 Keys, No. 36.

1 knife, clasp.

1 Plate, preserving, bracket, fore sight.
Springs— 1 Catch cam lever. 1 Latch carrier ring in leather pocket.
1 Tape measure.
1 Spring, clip carrier ring.
2 Pins, keep, hinge bolt, cam lever.
1 Drill tube.
2 Clamps, tangent sight.
1 Plate, preserving, bracket, fore sight.
2 Keys, No. 5.

2 Plugs, filling.
2 Washers, leather.
1 Box, chalk.
1 Key, powder case.

UPPER TRAY.

1 Fore sight.

1 Fore sight.

(As to prices in brackets, see top of page 2.)

GUNS. Handbooks for. (*And see* **GUNS.** Drill for):—
- 60-pr. B.L. Land Service. 1913. 1*s.* 6*d.* (1*s.* 3*d.*)
- 18-pr. Q.F. Land Service. 1913. (Reprinted, with Amendments, 1914). 1*s.* (11*d.*)
- 15-pr. B.L. Marks II. to IV., and Carriages, Marks II.* and IV., and Wagon, and Limber, Mark IV. Field Batteries. 1914. Provisional. 1*s.* (10*d.*)
- 15-pr. B.L.C. Marks I., II., II.*, and IV. with Mark I. Carriage, and Marks I., I*a*, I*b*, and I*c* Limbers and Wagons. Land Service. 1912. 1*s.* (10*d.*)
- 15-pr. Q.F. Land Service. 1914. 1*s.* 6*d.* (1*s.* 2*d.*)
- 13-pr. Q.F. Land Service. 1913. (Reprinted, with Amendments, 1914). 1*s.* 3*d.* (1*s.* 1*d.*)
- 12-pr. B.L. of 6-cwt. Marks I. to IV. and IV*a*, and Carriages Marks I.*, I.**, and II. Horse Artillery. 1905. 1*s.* (11*d.*)
- 10-pr. Jointed B.L. Mule Equipment. 1914. 1*s.* 6*d.* (1*s.* 2*d.*)
- 9·45-inch B.L. Howitzer. 1906. 9*d.* (7*d.*)
- 9·2-inch B.L. Mark IX., "C" Mark IX., and Marks X., X^v., and X.* Land Service. 1912. 1*s.* (11*d.*)
- 8-inch R.M.L. Howitzer of 70 cwt. Movable Armament and Armament of Works. Land Service. 1901. 2*s.* (1*s.* 6*d.*)
- 6-inch B.L. and B.L.C. Guns, Mountings, &c. 1904. 1*s.* 6*d.* (1*s.* 4*d.*)
- 6-inch B.L. Marks VII. and VII^v. Land Service. 1911. 9*d.* (8*d.*)
- 6-inch B.L. 30-cwt. Howitzer. Marks I. and I*. 1915. 1*s.* 6*d.*
- 6-inch Q.F. Land Service. 1903. 1*s.* (10*d.*)
- 6-inch "B" Q.F. Land Service. 1911. 1*s.* (10*d.*)
- 5·4-inch *B.L. Howitzer.* Mark I. 1902. 1*s.* 6*d.* (1*s.* 2*d.*)
- 5-inch B.L. Marks I.—V. 1901. 9*d.* (9*d.*)
- 5-inch B.L. Marks IV.—V. Land Service. 1903. 1*s.* 6*d.* (1*s.* 2*d.*)
- 5-inch B.L. Howitzer. 1909. 9*d.* (9*d.*) (*Under revision*)
- 4·7-inch Q.F. Fixed Armaments. Land Service. 1904. 1*s.* (11*d.*)
- 4·7-inch Q.F.B. on Travelling Carriages. Land Service. 1910. (Reprinted, with Amendments, 1914). 9*d.* (8*d.*)
- 4·5-inch Q.F. Howitzer. Land Service. 1914. 1*s.* 3*d.* (1*s.* 1*d.*)
- 2·95-inch Q.F. Mule Equipment and Man Transport Equipment. 1914. 2*s.* (1*s.* 6*d.*)
- ·303-inch Vickers Machine (Magazine Rifle Chamber), on Tripod Mounting, Mark IV. 1914. 6*d.* (6*d.*)
- ·303-inch Nordenfelt 3-barrel and Gardner 2-barrel converted from 0·4-inch and 0·45-inch M.H. Chamber, Magazine Rifle Chamber, on Carriages. 1900. 9*d.* (8*d.*)

HISTORICAL RECORDS OF THE BRITISH ARMY:—
- Horse Guards. 5*s.* (3*s.* 7*d.*)
- Dragoon Guards, 3rd, 4th, 5th, 6th, and 7th. Each 4*s.* (3*s.*)
- *Dragoons, 1st, 3rd, 7th, 14th, and 16th. Each* 4*s.* (3*s.*)
  - Ditto. 12th and 13th. Each 3*s.* (2*s.* 3*d.*)
- Marine Corps. 3*s.* (2*s.* 2*d.*)
- Foot, 2nd, 6th, 8th, 10th, 11th, 13th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 34th, 36th, 39th, 46th, 53rd, 67th, 71st, 72nd, 73rd, 74th, 86th, 87th, and 92nd. Each 4*s.* (3*s.*)
- Do. 14th, 56th, 61st, 70th, and 88th. Each 3*s.* (2*s.* 3*d.*)

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- Ditto. The Scots Guards. 1*d.* (1*d.*)
- Ditto. The 6th (Inniskilling) Dragoons. 1*d.* (1*d.*)
- Ditto. Revised Editions. 1*d.* (1*d.*) each:—
  - Alexandra, Princess of Wales's Own (Yorkshire Regiment).
  - The Bedfordshire Regiment.
  - The Black Watch (Royal Highlanders).
  - The Cameronians (Scottish Rifles).
  - The Cheshire Regiment.
  - The Duke of Wellington's West Riding Regiment.
  - *The Durham Light Infantry.*
  - The East Lancashire Regiment.
  - The East Surrey Regiment.
  - The Hampshire Regiment.
  - The Highland Light Infantry.
  - The King's Own Yorkshire Light Infantry.
  - The Lancashire Fusiliers.
  - The Loyal North Lancashire Regiment. (*In the press*)
  - The Northamptonshire Regiment.
  - The Oxfordshire and Buckinghamshire Light Infantry.
  - The Prince Albert's (Somersetshire Light Infantry).
  - The Prince of Wales's Leinster Regiment (Royal Canadians).
  - The Prince of Wales's Volunteers (South Lancashire Regiment).
  - The Princess Charlotte of Wales's (The Royal Berkshire Regiment).
  - The Princess Louise's Argyll and Sutherland Highlanders.
  - The Royal Inniskilling Fusiliers.
  - The Royal Sussex Regiment.
  - The Royal Warwickshire Regiment.
  - The Royal Welsh Fusiliers.
  - The Suffolk Regiment.
  - The Welsh Regiment.

HOSPITALS. MILITARY FAMILIES'. Nursing Staff Regulations. Dec. 1909. 1*d.* (1*d.*)

(As to prices in brackets, see top of page 2.)

HOSTILITIES WITHOUT DECLARATION OF WAR FROM 1700 TO 1870. 2*s.* (1*s.* 7*d.*).

HYGIENE. ELEMENTARY MILITARY. Manual of. 1912. 6*d.* (6*d.*)

INDIAN EMPIRE. OUR. A short review and some Hints for the use of Soldiers proceeding to India. 6*d.* (6*d.*)

INFANTRY TRAINING. (4-company organization.) 1914. 6*d.* (6*d.*)

INSTITUTES. Garrison and Regimental. Rules for the Management of. 1912. 1*d.* (1*d.*)

INTELLIGENCE DUTIES IN THE FIELD. Regns. for. 1904. 2*d.* (2*d.*)

ITALIAN CAVALRY TRAINING REGULATIONS. 1911. Training for Marches, Tactics of Minor Units, and Training of Patrols. Translated. 4*d.* (3*d.*)

JAMAICA. Standing Orders. 1912. 1*s.* (9*d.*)

JERSEY. ROYAL MILITIA OF THE ISLAND OF. Regulations. 1914. With the Jersey Militia Law, 1905. 1*s.* 3*d.* (11*d.*)

KING'S REGULATIONS AND ORDERS FOR THE ARMY. 1912. (Reprinted, with Amendments published in Army Orders up to Aug. 1, 1914). 1*s.* (1*s.*)

KIT PLATES:—

Artillery. Royal—
- 1. Horse and field. Kit in Barrack Room. 1912. 2*d.* (2*d.*)
- 2. Ditto. Kit laid out for Inspection. 1908. 2*d.* (2*d.*)
- 6. Garrison. Kit laid out for Inspection. 1909. 2*d.* (2*d.*)
- 10. Ditto. Kit in Barrack Room. 1909. 2*d.* (2*d.*)

Cavalry. 1891. 1*d.* (1*d.*)

Engineers. Royal—
- 1. Dismounted. Detail of Shelf and Bedding, with Marching Order ready to put on. Detail of Shelf and Bedding, with Drill Order ready to put on. 1914. 1*d.* (1*d.*)
- 2. Dismounted. Full Kit laid out for Inspection in Barrack Room. 1914. 1*d.* (1*d.*)
- 4. Mounted N.C.O. or Driver and Field Troop Sapper. Full Kit laid out for Inspection in Barrack Room. 1910. 1*d.* (1*d.*)
- 5. Mounted. Detail of Shelf and Bedding. 1910. 1*d.* (1*d.*)
- 6. Driver, with pair of Horses. Field Kit laid out for Inspection on Parade, including Articles carried in Valise on Baggage Wagon. 1899. 1*d.* (1*d.*)

Infantry—
- 1. Kit in Barrack Room. 1905. 2*d.* (2*d.*)
- 2. Kit laid out for Inspection. 1905. 2*d.* (2*d.*)
- Highland. 1884. 1*d.* (1*d.*)

Medical Corps. Royal Army. Kit in Barrack Room. 1912. 2*d.* (2*d.*)

Ordnance Corps. Army. For Guidance at Marching Order and Kit Inspections. 2*d.* (2*d.*)

LARGE FORMATIONS. The Operations of. (Conduite des Grandes Unités). Translated from the Field Service Regulations of the French Army, dated Oct. 28, 1913. 6*d.* (5*d.*)

LAW. Military. Manual of. 1914. 2*s.* (1*s.* 9*d.*)

LAW FOR THE RESERVE FORCES AND MILITIA. Manual of. 1886. 1*s.* 6*d.* (1*s.* 2*d.*)

MACHINE-GUN. Tests of Elementary Training. 1*d.* (1*d.*)

MACHINE GUNS AND SMALL ARMS, ·303-inch. Nomenclature of Parts, Stripping, Assembling, Action, Jams, Missfires, Failures, and Inspection of. Revised Edition. 1913. 3*d.* (3*d.*); Amendments, No. 1. 1*d.* (1*d.*)

MAGAZINES AND CARE OF WAR MATÉRIEL. Regulations for. 1913 9*d.* (9*d.*); Amendments, July 1914. 1*d.* (1*d.*)

MAP READING AND FIELD SKETCHING. Manual. 1912. (Reprinted, with Additions, 1914). 1*s.* (11*d.*) (*And see* Schools, Army.)

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